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AUTHOR INDEX

Agin, Bill 189
Atwood, John T. 119
Balla, David 77
Bartley, S. Howard 111
Bernstein, Edward 197
Beshai, James A. 141
Brotsky, S. Joyce 49
Burroughs, Wayne A. 3
Carlin, T. June 49
Cash, Thomas F. 123
Cassel, Russell N. 135
Chiu, Lian-Hwang 273
Deckner, C. William 123
deVito, Robert 97
Edgington, Eugene S. 13
Erickson, Jeanne M. 237
Falkenberg, Steven D. 119
Flaherty, Lawrence 97
Forbes, Gordon B. 163
Gescheider, George 91
Greenberg, Howard C. 123
Greenfeld, Norman 85
Gromoll, Henry F. 163
Grossman, Robert W. 111
Gunderson, E. K. Eric 237
Haberman, Marc J. 209
Hall, Patricia 189
Hartnett, John J. 131
Higgins-Trenk, Ann 285
Horne, William C. 209
Husted, John R. 189
Jaffee, Cabot L. 3
Kirk, Roger E. 155
Kline, Ned J. 71
Koehn, David J. 71
Kool, V. K. 63
Kutner, S. Jerome 263
Lachenmeyer, Charles W. 295
Lester, David 233
Levita, Eric 149
Looft, William R. 285
Lyle, Charles Elmer 243
Macchitelli, Frank J. 97
Mahrer, Alvin R. 21
Mazer, Donald B. 21
McCann, Lee I. 71
McCarthy, Elizabeth 77
McDonald, Blair W. 237
McMorris, Robert F. 165
Meunier, Gary F. 299
Meunier, Jo Ann 299
Mozdzierz, Gerald J. 97
Ohnmacht, Fred W. 165
Olmedo, Esteban L. 155
Peretti, Peter O. 67, 203, 291
Peterson, Robert A. 257
Pierce, Robert A. 221
Reier, Gerold W. 135
Riklan, Manuel 149
Ritz, Douglas 299
Schludermann, Eduard 29, 41, 169, 213
Schludermann, Shirin 29, 41, 169, 213
Schwartz, Allan J. 221
Sharpe, Louis K. 257
Simon, William E. 197
Smolen, Diane L. 111
Tamayo, Federico M. V. 209
TeVault, R. Kent 163
Thomas, Sally Baskin 243
Valentine, Alonzo M., Jr. 103
Vikan, Arne 55
Williams, Warren S. 179
Wright, John H. 91
Zapp, Mary L. 209
Zigler, Edward 77

TABLE OF CONTENTS

Attitudinal reaction of white females toward two black female collaborators . 3
BY WAYNE A. BURROUGHS AND CABOT L. JAFFEE

Randomization tests with statistical control over concomitant variables . . 13
BY EUGENE S. EDGINGTON

Developmental factors in masturbation: Family background antecedents and later personality patterns 21
BY DONALD B. MAZER AND ALVIN R. MAHRER

Adolescent perception of parent behavior (CRPBI) in Hutterite communal society 29
BY SHIRIN SCHLUDERMANN AND EDUARD SCHLUDERMANN

Paternal attitudes in Hutterite communal society 41
BY SHIRIN SCHLUDERMANN AND EDUARD SCHLUDERMANN

Recognition paired-associate learning in preschool children 49
BY S. JOYCE BROTSKY AND T. JUNE CARLIN

Performed actions as determinant of horizontal decalage in a logical structure: I. The quantitative aspect 55
BY ARNE VIKAN

Relationship between kinesthetic and spiral aftereffect and Eysenck's theory of personality 63
BY V. K. KOOL

Effects of noncompetitive, competitive instructions, and sex on performance in a color-word interference task 67
BY PETER O. PERETTI

The effects of body size and body markings on nonpolarized schooling behavior of zebra fish (*Brachydanio rerio*) 71
BY LEE I. MCCANN, DAVID J. KOEHN, AND NED J. KLINE

Some correlates of negative reaction tendencies in institutionalized retarded children 77
BY DAVID BALLA, ELIZABETH MCCARTHY, AND EDWARD ZIGLER

A study of student values 85
BY NORMAN GREENFELD

Reaction time as a function of magnitude estimations of vibrotactile internal noise 91
BY GEORGE A. GESCHEIDER AND JOHN H. WRIGHT

Temperament characteristics of chronic alcoholics as measured by the Guilford-Zimmerman Temperament Survey 97
BY GERALD J. MOZDZIERZ, FRANK J. MACCHITELLI, LAWRENCE FLAHERTY, AND ROBERT DEVITO

Zen and the psychology of education 103
BY ALONZO M. VALENTINE, JR.

Effect of intermittency on stereopsis 111
BY DIANE L. SMOLEN, ROBERT W. GROSSMAN, AND S. HOWARD BARTLEY

The bipolarity of semantic space as related to concept complexity . . . 119
By John T. Atwood and Steven D. Falkenberg

The relationship of cue strength and temporal interval to schizophrenic associative disorders . . . 123
By C. William Deckner, Howard C. Greenberg, and Thomas F. Cash

Group risk taking and expected values . . . 131
By John J. Hartnett

Comparative analysis of concurrent and predictive validity for the GATB Clerical Aptitude Test Battery . . . 135
By Russell N. Cassel and Gerold W. Reier

Behavioral correlates of the EEG in delinquents . . . 141
By James A. Beshai

Psychophysiological changes after cryothalamotomy for parkinsonism . . . 149
By Eric Levita and Manuel Riklan

The effects of manifest anxiety and practice on performance of a complex reaction time task . . . 155
By Esteban L. Olmedo and Roger E. Kirk

Trustfulness and suspiciousness as a function of liberal or conservative church membership: A field experiment . . . 163
By R. Kent TeVault, Gordon B. Forbes, and Henry F. Gromoll

Creativity as a function of field independence and dogmatism . . . 165
By Fred W. Ohnmacht and Robert F. McMorris

Maternal child rearing attitudes in Hutterite communal society . . . 169
By Shirin Schludermann and Eduard Schludermann

A semantic differential study of the meaning of personality test items to children from different socioeconomic groups . . . 179
By Warren S. Williams

The effectiveness of time-out in reducing maladaptive behavior of autistic and retarded children . . . 189
By John R. Husted, Patricia Hall, and Bill Agin

The relationship between self-esteem and perceived reciprocal liking: A sociometric test of the theory of cognitive balance . . . 197
By William E. Simon and Edward Bernstein

Geotactic orientation of *Liguus fasciatus* . . . 203
By Peter O. Peretti

Adjustment to same sex and opposite sex in coeducational and noncoeducational high schools . . . 209
By Federico M. V. Tamayo, Marc J. Haberman, Mary L. Zapp, and William C. Horne

Response set analysis of a paternal attitude research instrument (PARI) . . . 213
By Shirin Schludermann and Eduard Schludermann

Personality styles of student activists . . . 221
By Robert A. Pierce and Allan J. Schwarz

A preliminary note on the evaluation of those upon whom one depends . . 233
By David Lester

Reliability of demographic and job related information 237
By Jeanne M. Erickson, Blair W. McDonald, and E. K. Eric Gunderson

Influence of age, sex, and *IQ* differences on behavior of profound retardates as measured by the rating scale technique 243
By Charles Elmer Lyle and Sally Baskin Thomas

A comparison of two approaches to the analysis of personality differences . 257
By Louis K. Sharpe and Robert A. Peterson

A survey of fear of pregnancy and depression 263
By S. Jerome Kutner

Manifested anxiety in Chinese and American children 273
By Lian-Hwang Chiu

Cognitive capacity of very young children: Yet another replication . . . 285
By Ann Higgins-Trenk and William R. Looft

Comparison of albino rats and mongolian gerbils on the visual cliff . . . 291
By Peter O. Peretti

The effectiveness of a "recreational" and "therapeutic" encounter with psychiatric patients 295
By Charles W. Lachenmeyer

Postlist rehearsal and the recency effect of serial recall 299
By Gary F. Meunier, Jo Ann Meunier, and Douglas Ritz

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Genetic Psychology Monographs *(continued)*

VOLUME 14—July-December, 1933

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VOLUME 15—January-June, 1934

1. Studies in the psychology of tone and music—P. R. Farnsworth
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5 & 6. The limits of learning ability in rhesus monkeys—H. A. Fjeld

VOLUME 16—July-December, 1934

1. A statistical study of ratings on the California Behavior Inventory for Nursery-School Children—H. S. Conrad
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VOLUME 17—January-December, 1935

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5. On intelligence of epileptic children—E. B. Sullivan and L. Gahagan
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VOLUME 18—January-December, 1936

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VOLUME 19—January-December, 1937

1. Psychological bases of self-mutilation—C. Dabrowski
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VOLUME 20—January-December, 1938

1. The relationship between characteristics of personality and physique in adolescents—P. S. de Q. Cabot
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Graphic representation of a man by four-year-old children in nine prescribed drawing situations—P. F. Gridley
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4. A comparative study by means of the Rorschach method of personality development in twenty pairs of identical twins—E. Troup
Individual differences in the facial expressive behavior of preschool children: A study by the time-sampling method—C. Swan

VOLUME 21—January-December, 1939

1. An experimental analysis of "level of aspiration"—R. Gould
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The capacity of the rhesus and cebus monkey and the gibbon to acquire differential response to complex visual stimuli—W. E. Galt
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VOLUME 22—January-December, 1940

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2. Aggressive behavior in young children and children's attitudes toward aggression—M. D. Fite
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The prediction of the outcome-on-furlough of dementia praecox patients—J. S. Jacob
Significant characteristics of preschool children as located in the Conrad inventory—K. H. Read
4. Learning by children at noon-meal in a nursery school: Ten "good" eaters and ten "poor" eaters—J. B. McCay, E. B. Waring, and P. J. Kruse
Studies in the interpretation of play: I. Clinical observation of play disruption in young children—E. H. Erikson

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1. An analysis of certain variables in a developmental study of language—F. M. Young
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An analysis of the mental factors of various age groups from nine to sixty—B. Balinsky
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Individual differences in apperceptive reaction: A study of the response of preschool children to pictures—E. W. Amen

VOLUME 24—July-December, 1941

1. Twins *T* and *C* from infancy to adolescence: A biogenetic study of individual differences by the method of co-twin control—A. Gesell and H. Thompson
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2. The Fels child behavior scales—T. W. Richards and M. P. Simons
Measurement of the size of general English vocabulary through the elementary grades and high school—M. K. Smith
Stereotypes in the field of musical eminence—P. R. Farnsworth

VOLUME 25—January-June, 1942

1. A study of factors determining family size in a selected professional group—J. C. Flanagan
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Genetic Psychology Monographs *(continued)*

VOLUME 26—July-December, 1942

1. The critical frequency limen for visual flicker in children between the ages of 6 and 18—V. L. Miller
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VOLUME 27—January-June, 1943

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years of age—M. L. Pignatelli

VOLUME 28—July-December, 1943

1. Separation anxiety in young children: A study of hospital cases—H. Edelston
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technique—H. Werner

VOLUME 32—July-December, 1945

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VOLUME 33—January-June, 1946

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and W. L. Woods

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E. W. Amen
A study of the vocational interest trends of secondary school and college women—A. M. Cawley

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1. Maze test validation and psychosurgery—S. D. Porteus and H. N. Peters
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VOLUME 37—January-June, 1948

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relationships—P. E. Eiserer
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VOLUME 40—July-December, 1949

1. An experimental study of what young school children expect from their teachers—B. Biber and C. Lewis
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The relationship between level of vocational aspiration and certain personal data: A study of some traits
fluences bearing on the prestige level of vocational choice—J. Stubbins

VOLUME 42—July-December, 1950

1. Personality patterns of suicidal mental hospital patients—N. L. Farberow
Sex-rôle identification in young children in two diverse social groups—M. Rabban
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warmth by neurotics and paranoid schizophrenics in discussion group situations—D. Shapiro
An experimental study of avoidance—R. F. Hefferline

VOLUME 43—January-June, 1951

1. A study of copying ability in children—E. A. Townsend
Prestige motivation of gifted children—D. P. Ausubel
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VOLUME 44—July-December, 1951

1. The organization of hostility controls in various personality structures—S. Fisher and E. Hinds
Children and radio: A study of listeners and non-listeners to various types of radio programs in terms of se
ability, attitude, and behavior measures—E. A. Ricciuti
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VOLUME 45—January-June, 1952

1. Japanese-American personality and acculturation—W. Caudill
2. A statistical study of the Freudian theory of levels of psychosexual development—C. A. Barnes

Genetic Psychology Monographs *(continued)*

VOLUME 46—July-December, 1952

1. The relationship of social status, intelligence, and sex of ten- and eleven-year-old children to an awareness o poverty—F. J. Estvan
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VOLUME 47—January-June, 1953

1. Ability and accomplishment of persons earlier judged mentally deficient—D. C. Charles
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Symptom correlates for descriptive diagnosis—J. R. Wittenborn, *et al.*

VOLUME 48—July-December, 1953

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VOLUME 49—January-June, 1954

1. Factors underlying major reading disabilities at the college level—J. A. Holmes
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Certain determinants and correlates of authoritarianism—S. Siegel
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VOLUME 50—July-December, 1954

1. A study of the relationship between play patterns and anxiety in young children—E. W. Amen and N. Renison
Operational exploration of the conceptual self system and of the interaction between frames of reference—M. Edelso and A. E. Jones
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Measuring personality in developmental terms: The Personal Preference Scale.—M. H. Krout and J. K. Tabin

VOLUME 51—January-June, 1955

1. Some relations between techniques of feeding and training during infancy and certain behavior in childhood—A Bernstein
The expression of personality in drawings and paintings—L. H. Stewart
2. Negative stereotypes concerning Americans among American-born children receiving various types of minority-grou education—J. A. Fishman
The Lincoln-Oseretsky Motor Development Scale—W. Sloan

VOLUME 52—July-December, 1955

1. Some personality correlates of sex, sibling position, and sex of sibling among five- and six-year-old children—H. L Koch
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VOLUME 53—January-June, 1956

1. As the psychiatric aide sees his work and problems—F. L. Wells, M. Greenblatt, and R. W. Hyde
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VOLUME 54—July-December 1956

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1. Emotional aspects of political behavior: The woman voter—E. M. Bennett and H. M. Goodwin
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Genetic Psychology Monographs *(continued)*

VOLUME 59—January-June, 1959

1. Freshman Rorschachs and college performance—G. R. Schmeidler, M. J. Nelson, and M. Bristol
Perceptual aspects of attributed movement—R. W. Coan
Men and women: Personality patterns and contrasts—E. M. Bennett and L. R. Cohen
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Parental identification in young children—W. Emmerich
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VOLUME 61—January-June, 1960

1. Identifying socially maladjusted school children—A. A. Adams
Social interaction in an interracial nursery school—H. W. Stevenson and N. G. Stevenson, *et al.*
Interests of pre-adolescent boys and girls—M. Amatora
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VOLUME 62—July-December, 1960

1. The reading process: A descriptive, interdisciplinary approach—M. P. Langman
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Longitudinal survey of child Rorschach responses: Older subjects aged 10 to 16 years—L. B. Ames
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VOLUME 63—January-June, 1961

1. Make a sentence test: An approach to objective scoring of sentence completions—E. F. Borgatta
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VOLUME 64—July-December, 1961

1. Coping patterns of preschool children in response to intelligence test demands—A. Moriarty
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VOLUME 65—January-June, 1962

1. A Rorschach study of the development of personality structure in white and Negro children in a Southe community—A. C. Price
Measuring personality patterns of women—J. Loevinger
Home interests in early adolescence—M. Amatora
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VOLUME 66—July-December, 1962

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Parental child-rearing attitudes and their correlates in adolescent hostility—S. B. Chorost
Some explorations into the nature of anxieties relating to illness—P. R. Robbins
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VOLUME 67—January-June, 1963

1. Verbatim dialogue of a mother and child in therapy—C. E. Moustakas
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VOLUME 68—July-December, 1963

1. Brain dynamism as reflected in illusions—G. K. Yacorzynski
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(Manuscripts are printed in the order of final acceptance)

A scale to measure the social distance between college students and faculty . 3
BY MARTIN S. FIEBERT

Item susceptibility to attempted faking as related to item characteristic and adopted fake set 9
BY RICHARD E. DOLL

Analysis of sequential effects for a four-choice reaction time experiment . . 17
BY ROBERT J. REMINGTON

Item failure and performance on subsequent items of an achievement test . 29
BY ROGER L. TERRY AND RANDALL M. ISAACSON

A further test of Johnson's "Chunk-Code" notion 33
BY KENNETH A. JACOBUS AND CRAIG T. LOVE

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Selected personality characteristics of high school athletes and nonathletes . . 39
BY R. FLETCHER AND L. DOWELL

The effect of feedback on the control of cardiac rate 43
BY WILLIAM W. FINLEY

An attempt to dramatize the "double-bind" hypothesis of the schizophrenogenic family 55
BY ISRAEL ELI STURM

The effects of delay interval on word recall and clustering 67
BY DENNIS F. FISHER

Dimensions of color vision revisited 79
BY LEROY A. STONE AND GARY J. COLES

The influence of random reinforcement on heart rate during extinction . . 89
BY HUBERT LAFORGE

School-related perceptions in handicapped children 101
BY ELIZABETH C. THOMAS AND KAORU YAMAMOTO

Behavior in complex learning situations involving three levels of difficulty . 119
BY SHELDON J. LACHMAN

The utility of behavior management techniques in changing interracial behaviors 127
BY ROBERT L. WILLIAMS, WILLIAM H. CORMIER, GARY L. SAPP, AND HENRY B. ANDREWS

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A SCALE TO MEASURE THE SOCIAL DISTANCE BETWEEN COLLEGE STUDENTS AND FACULTY*[1, 2]

California State College, Long Beach

MARTIN S. FIEBERT

A. Introduction

The major purpose of this study was to develop an instrument to assess college students' perceptions of the social distance between themselves and their instructors. In an earlier paper the author (3) examined three models of college education—information transmission, problem solving, and personality modification—exploring within each model the differing roles and role perceptions of teacher and learner. It was suggested that the trend in contemporary college education is toward the de-emphasis of the traditional information transmission model of instruction in favor of the other two. This being the case, a necessary, although not sufficient, condition for effective learning and teaching is the emergence of broader and more overlapping roles for professors and students. A first step in the assessment of role perceptions and role changes may be accomplished by the development of a student-faculty social distance scale.

The construct of social distance was developed by Bogardus (1) in his pioneering studies of attitudes among differing ethnic groups. He designed a seven-point scale to assess a very broad social distance continuum. The scale ranged from a high distance item which indicated that members of the judged group would not be permitted to enter this country to a low distance item which stated that members of the judged group would be accepted into close kinship by marriage.

B. Method

1. *Scale Construction*

The scale used in the present study was geared to assess a relatively narrower range of social distance. Items were written to reflect the social distance

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[2] The author wishes to thank Miss Suzanne Hill and Mrs. Jane Stake for their assistance in the collection and analysis of data.

experienced by students in their interaction with faculty. The scale itself consisted of 10 items which were constructed from a pool of statements generated by a number of students who were asked to record behavior which they have experienced or would like to experience between themselves and their instructors. The directions and scale items were as follows:

Please respond to the following items concerned with faculty-student interaction. While your interactions are probably different with different instructors and acknowledging that the age differential may be a factor for both students and faculty, indicate what is *typically* true of most of your relationships. Put an "X" in the appropriate column next to each item if it applies or an "O" if it doesn't apply. In column "A" indicate how you generally *have* behaved and in column "B" how you would *like to* behave.

1. Student nods to instructor and acknowledges the instructor's verbal greeting.
2. Student stays after class to discuss academic matters.
3. Student initiates verbal greeting to professor on campus.
4. Student spontaneously visits instructor during office hour to discuss academic matters.
5. Student and professor engage in short social conversation on campus.
6. Student drops by professor's office to talk about personal problem which is not related to his class performance.
7. Student and professor have lunch or coffee together on campus.
8. Student spontaneously uses professor's first name in conversation with him.
9. Student and professor spend time together off campus engaged in activities of common interest (sporting activities, parties, etc.).
10. Student and professor are in close interaction involving mutual self disclosure and mutual need satisfaction.

2. *Subjects*

Subjects in the study consisted of 507 students at California State College, Long Beach (CSCLB), who completed the scale within the first four weeks of the fall semester, 1969. Since the major purpose of the investigation was to assess the discriminability of the scale items, representativeness was not a factor in the selection of *S*s. All students in 12 different courses, primarily in the Psychology or Sociology Departments, completed the scale. Information concerning each student's age, sex, class standing, academic major, and approximate grade point average (GPA) was collected. No significant differences were found between our sample and the total college population at CSCLB with regard to the variables of age, sex distribution, and overall GPA. Our sample was also similar to the college population in terms of the percentage of graduate students and juniors; however, it underrepresented the percentage of freshmen and sophomores and overrepresented the percentage of seniors. As might be expected, the majority of students in the sample were majoring in either Psychology or Sociology.

C. RESULTS

The results of the study have been examined in three areas: (*a*) item discrimination, (*b*) a comparison between student's perception of typical and desired interaction with faculty, and (*c*) the relationship between the variables of age, sex, and academic performance and perceived social distance.

The total number and percent of positive responses by the 507 *S*s to each of the 10 items concerning "typical" behavior with faculty appear in Table 1.

TABLE 1
NUMBER AND PERCENT OF POSITIVE RESPONSES BY THE 507 *S*S TO EACH OF THE 10 ITEMS CONCERNING "TYPICAL" BEHAVIOR WITH FACULTY

Item no.	Number positive responses	% positive responses
1	449	89
2	304	60
3	376	74
4	221	44
5	207	41
6	105	21
7	67	13
8	88	17
9	51	10
10	42	8

Each item was scored 1 for the absence of social distance and zero for its presence. An individual's total score, which could range from zero to 10, reflected his overall perception of social distance. The mean of student perception of "typical" interaction with faculty was 3.7 ($SD = 2.2$), while the mean of desired interaction with faculty was 7.6 ($SD = 2.5$). The difference between these means was statistically significant ($t = 25.7$, $p < .001$) and Ω^2 was computed and revealed that 40% of the variance of the independent variable was accounted for by the dependent variable.

An analysis of variance for unequal *N*'s with main effects of sex, age, and GPA was completed. Results reveal significant differences for the effects of age ($F = 6.3$, $p < .01$) and GPA ($F = 5.6$, $p < .02$), and no significant differences for the sex variable or any of the interactions. Subjects who were older, as well as those who reported higher GPA's than the average in the sample, had scores reflecting lower social distance with instructors.

D. Discussion

The results indicate that the scale, while somewhat crude in its discriminability at the upper end of the social distance continuum, can be a useful assessment instrument. If items were to be placed in their proper statistical sequence one could study student perceptions of social distance as it relates to different college institutions, course contents, teaching philosophies, and other variables within and between students and instructors.

The fact that a significant difference existed between students' typical and desired level of social distance suggested that the students in our sample may have been dissatisfied with their current level of social interaction with faculty. This factor along with others may play its part in nationwide student disenchantment. One aspect of educational reform may involve the conscious effort on the part of instructors to reduce such distance. The difficulties of this step are implied in Farber's (2) critique of college professors who, he maintains, have much attachment to their high power role and great reluctance to relate more equally with their students.

The trend in the data which reveals that older and higher achieving students perceive less distance between themselves and their instructors appears to be a function of two interrelated factors. First, such students, in a real world sense, probably have more in common with their instructors in terms of age, experience, and shared academic values and, therefore, find it easier both to approach and be attractive to their professors. In addition, the older and more academically competent student possibly has a higher level of self-esteem and, thus, finds it easier to overcome social distance barriers.

E. Summary

A 10-item scale constructed from the perspective of college students was developed to assess the dimension of student-faculty social distance. The scale was administered to 507 students who judged each item with respect to their typical and desired levels of social distance. Results indicated that students significantly preferred a lower level of distance than they usually experienced with their instructors. In addition, within our sample it was found that older students, as well as higher achieving students, experienced a lower level of social distance.

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ITEM SUSCEPTIBILITY TO ATTEMPTED FAKING AS RELATED TO ITEM CHARACTERISTIC AND ADOPTED FAKE SET* [1]

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A. INTRODUCTION

The problem of faking or response dissimulation by various types of respondents has been the subject of many studies (8, 11, 13). Also the fakability of various psychological measures has been widely investigated (2, 3, 10, 14, 16). Finally, various approaches for coping with the faking problem are contained in the literature. These approaches are mainly represented by (*a*) the forced-choice item technique (10, 12, 16), (*b*) correction or suppressor scales (15), (*c*) development of items that do not lose their validity under a faking condition (9, 10), (*d*) identifying the fakers (4, 5, 16).

Although substantial talent and effort have been addressed to the faking problem the results have been rather impoverished. The general reaction to such findings seems to have resulted in a reduction rather than intensification of research in the area. This is an unfortunate trend for certainly the problem is of sufficient importance to warrant more attention.

A frequent approach in developing and/or evaluating psychological instrument's ability to deal with the problem of faking is to administer it to a group of subjects twice; first responding to it honestly and then answering it in such a fashion as to "look as good as possible" on some particular trait, job application, etc. However, certain research (8, 17) indicates that faking in real life consists more of a subtle slanting of responses than one of uninhibited dissimulation. It is not difficult to assume that a group of individuals trying to fake a test in a real life testing situation will do so to varying degrees and will have adopted more than just the "look as good as possible" faking set. However, little research has been concerned with the faking of psychological measures when more subtle fake sets have been adopted. Such a lack may, in part, be an

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important reason for the rather poor progress made toward management of the faking problem.

Doll (6) demonstrated that fake detection keys developed to detect more subtle fake sets—viz., "fake to look good but (beware) of having to defend your answers in an interview situation" and "fake to look good but (beware) of the availability of a lie score key"—were more effective in identifying fakers than a fake detection key developed to detect unsubtle faking: viz., "look as good as possible." Since the question has never been answered in the literature, it is difficult to know what faking sets predominate in the real life situation. However, it would seem reasonable to assume that these three faking sets do exist, to some degree, among individuals attempting to fake psychological measures in real life testing situations.

It has been assumed that objective or verifiable items are less likely to be faked than subjective or nonverifiable items (14). However, no effort has been made to test this assumption with the use of various faking sets. In other words, does susceptibility to attempted faking of objective *versus* subjective items vary as a function of the adopted fake set. The present study attempts to answer this question.

In addition to the objective-subjective comparison, a second item characteristic was considered in the analysis. Frequently, items consist of multiple alternatives which lay on an obvious continuum (continuous) or do not fall on an obvious continuum (noncontinuous). Again the question was asked as to whether these two types of item response formats differ in susceptibility to attempted faking as a result of differences in adopted fake sets. Hopefully, such insight will contribute to an improved basis for a renewed effort into the problem of faking.

B. METHOD

1. *Subjects*

The subjects consisted of 300 Aviation Officer Candidates who were attending the Pre-Flight School phase of the Naval Aviation Training Program, Pensacola, Florida, during the years of 1967 and 1968. The training program format requires that a new class, the size of which varies from 30 to 60 students, be introduced into the program each week and that they remain together as a class for the entire 12 weeks of Pre-Flight. During this time they undergo a wide variety of academic, military, and physical training. All the subjects were college graduates.

2. *Psychological Measure*

The instrument used for the purposes of this study was a 200-item biographical inventory developed for predicting performance of applicants for research positions. The inventory contains a wide variety of questions about childhood activities, experiences, sources of derived satisfactions and dissatisfactions, descriptions of the subject's parents, academic experiences, attitudes and interests, value preferences, and self-descriptions.

3. *Item Categorization*

The inventory items were categorized on two different dimensions: (*a*) objective *versus* subjective, and (*b*) continuous *versus* noncontinuous. If an item called for a response that could conceivably be verified by an independent, objective means, it was classified as being objective. Alternately, an item considered not verifiable by such means was considered as being subjective. The basis for classifying an item as having a continuous or noncontinuous response format was simply whether or not the range of alternatives laid upon an obvious continuum.

The items were assigned to the above categories by two raters working independently. The simplicity of the task was reflected by the high percentage of agreement between the two raters: namely, 98% on the objective-subjective dimension and 93% on the continuous *versus* noncontinuous task. A third rater was used to break the tie for those few items upon which the original raters disagreed. The procedure resulted in the categorization of 35 items as being objective and 165 items as being subjective. On the other dimension, 148 of the items were considered as having a continuous response format with the remaining 52 items being classified as noncontinuous. Unfortunately, the two dimensions could not be examined simultaneously, since there were too few items that were both objective and noncontinuous to permit any meaningful comparisons.

4. *Administration Procedure*

The biographical inventory was administered to each subject twice with a five-week interval between administrations. Accompanying each inventory was a set of instructions on how the subject should respond. The instructions reflected one of the following four answering sets:

1. Please answer the items in this inventory as honestly as possible. The answers are for research purposes *only* and will be kept strictly *confidential.*

2. Please answer the items in this inventory as though you were applying for a *research* position. Attempt to make yourself look *good*, but try to be subtle about it. In other words, try to make yourself look good but keep in mind that you could be placed in a position of having to defend your answers in an interview situation.

3. Please answer the items in this inventory as though you were applying for a *research* position. Attempt to make yourself look *good*, but keep in mind that this inventory has a *lie* score key available which will identify those people who exaggerate.

4. Please answer the items in this inventory as though you were applying for a *research* position. Attempt to make yourself look as good as possible.

Each of the subjects answered the first time under set one. For the second administration each of the subjects received one of three faking response sets. This procedure produced three groups, one for each faking set, of 100 subjects. They were labeled as follows: 1) Group 1—Fake (subtle-interview), 2) Group 2—Fake subtle-lie score), 3) Group 3—Fake (unsubtle).

5. *Statistical Analysis*

A double cross validation design as desribed by Baker (1) was used in the item alternative analysis. Essentially this procedure can be described as follows:

1. Each of the three fake condition groups was divided into random halves ($N = 50$).

2. On each half a phi coefficient was determined for each item alternative. This statistic was based upon the difference between the percentage of subjects selecting the item alternative under the honest-take *versus* fake-take set.

3. A probability value for each item alternative in each half was determined.

4. Considering both halves together, compound probabilities [as described by Baker (1)] were determined for each item alternative.

5. Items containing an alternative(s) of .05 or less were considered to be susceptible to attempted faking.

With the use of the above information, chi squares were computed for the number of objective items and subjective items that were susceptible and non-susceptible to attempted faking under each of the three faking sets. The same chi-square analyses were done, also, in the case of the continuous *versus* non-continuous comparison.

C. RESULTS

Table 1 gives the frequencies of the objective and subjective items that were or were not significantly susceptible to attempted faking under each fake set

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and the chi-square values based upon the difference between the frequencies and those that would be expected. The results show that under Fake Set 1 (subtle-interview) significantly more ($p < .05$) of the subjective items were susceptible to attempted faking, while under Fake Set 2 (subtle-lie score) there was no significant difference. However, under Fake Set 3 (unsubtle) a greater proportion ($p < .02$) of the objective items were susceptible to attempted faking.

TABLE 1

CHI SQUARE OF OBJECTIVE ITEMS AND SUBJECTIVE ITEMS SIGNIFICANTLY AND NOT SIGNIFICANTLY FAKED (ATTEMPTED) FOR EACH OF THE THREE FAKE SETS

Fake sets	Faked	Not faked
Fake Set 1 (Subtle-Interview)		
Objective	6	29
Subjective	58	107
	$\chi^2 = 4.29$	$p < .05$
Fake Set 2 (Subtle-Lie Score)		
Objective	7	28
Subjective	39	116
	$\chi^2 = .21$	$p < .60$
Fake Set 3 (Unsubtle)		
Objective	34	1
Subjective	134	31
	$\chi^2 = 5.45$	$p < .02$

Table 2 examines the susceptibility to attempted faking under the different fake sets according to their continuous-noncontinuous response format. Here there exists a definite consistency across all fake sets. It was clear that those items having a continuous response format were more prone to large shifts in popularity than those items containing noncontinuous response formats. Apparently the continuous response formats, with their "high" and "low" ends of the item dimensions clearly defined, offered a more substantial basis for agreement among the subjects under the fake-take, thus producing large shifts in popularity on certain item alternatives.

D. DISCUSSION

It should be emphasized that the present study is concerned with certain characteristics of items and their susceptibility to *attempted* faking under different faking sets. It is not addressed to the fakability of items or their alternatives. The latter problem would require making a distinction between items (alternatives) that were keyed or not keyed to predict a given criterion. The present analysis makes no such distinction but includes all items and their alternatives regardless of their predictive effectiveness of a certain criterion.

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TABLE 2
CHI SQUARE OF CONTINUOUS ITEMS AND NONCONTINUOUS ITEMS SIGNIFICANTLY AND NOT SIGNIFICANTLY FAKED (ATTEMPTED) FOR EACH OF THE THREE FAKE SETS

Fake sets	Faked	Not faked
Fake Set 1 (Subtle-Interview)		
Continuous	54	94
Noncontinuous	10	42
	$\chi^2 = 15.85$	$p < .001$
Fake Set 2 (Subtle-Lie Score)		
Continuous	37	111
Noncontinuous	8	44
	$\chi^2 = 8.26$	$p < .01$
Fake Set 3 (Unsubtle)		
Continuous	131	17
Noncontinuous	37	15
	$\chi^2 = 8.64$	$p < .01$

Presumably the authors of the inventory had hopes of some potential predictive validity of all the items.

The findings, albeit within the confines of this study, suggest or support certain conclusions. They may be summarized as follows:

1. The notion of subjective items being more susceptible to attempted faking is supported if the respondent is concerned about an interview. Concern about the availability of a lie key score produces no favoring of objective or subjective items, while an unsubtle or "fake to look as good as possible" set produces the largest shifts in popularity among alternatives of objective items. This latter finding would suggest that the objective items were more easily associated with the stereotype of a good researcher.

2. Items consisting of alternatives that lay upon an obvious continuum—e.g., most . . . least, always . . . never, etc.—were more susceptible to attempted faking than the noncontinuous items. This was true regardless of the adopted fake set. Apparently, the existence of a continuous response format offers a more substantial basis for the attempted faking of an item.

3. Psychological measures least susceptible to attempted faking would be those consisting of objective items containing a noncontinuous response format accompanied by a warning of a possible follow-up interview.

4. Assuming a population of subtle fakers, one would benefit in attempts to develop a fake detection key if he would include subjective kinds of items with continuous response formats.

The findings of the present study demonstrate certain differences in the kinds of items that are susceptible to attempted faking as a function of differences in adopted fake sets. Lack of consideration for the existence of more subtle fake sets may have been a contributing influence to the retarded progress so far made in coping with the faking problem.

E. SUMMARY

It has been assumed that objective or verifiable items are less likely to be faked than subjective or nonverifiable items. Also, certain research indicates that faking in real life consists more of a subtle slanting of responses than one of uninhibited dissimulation which is the fake set most commonly used in research addressed to the problem of faking. The present study investigates item susceptibility to attempted faking as related to two item characteristics: (*a*) objective *versus* subjective, and (*b*) continuous *versus* noncontinuous. Two subtle fake sets and one unsubtle fake set were used. The findings of the present study demonstrate certain differences in the kinds of items that are susceptible to attempted faking as a function of differences in adopted fake sets.

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ANALYSIS OF SEQUENTIAL EFFECTS FOR A FOUR-CHOICE REACTION TIME EXPERIMENT*

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A. INTRODUCTION

The psychological literature on human information processing contains a number of theoretical notions concerning the manner in which humans process information and arrive at the decisions required by choice situations. Most of the present models assume that these decisions are made up of a collection of component decisions, and that the nature and organization of the component decisions can be inferred from the study of reaction times from a variety of choice situations.

In recent attempts to delineate successive stages of the reaction process, researchers have found it necessary to go beyond an examination of the overall reaction time (RT) for a particular stimulus series to an examination of the RT to conditional events. Sequential effects uncovered by this approach have led to modification of the original model of the choice reaction processes derived from information theory and presented by Hick (2).

Most of the research on sequential effects in RT data centers around the phenomenon known as the "repetition effect"—i.e., the often reported finding that the RT to a repeated signal is faster than the RT for a changed signal. Until very recently, it was generally believed that the repetition effect was the result of some sort of perceptual or response facilitation brought about by having seen or responded to the same stimulus event on the *immediately preceding* trial. However, more detailed sequential analysis by a few researchers (6, 8) indicates that the repetition effect cannot be attributed to a single repetition of a stimulus event. The experiment reported in the present paper was conducted to provide further information concerning the microstructure of underlying choice reaction processes by applying the comprehensive method of sequential analysis introduced by Remington (6) to data from a four-choice RT experiment.

In determining the repetition effect for data collected from a choice RT

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task, it has become common practice to find merely the difference between the mean for repetitions and nonrepetitions. Nonrepetitions (i.e., stimulus events immediately preceded by a different stimulus) are not subdivided into additional categories on the basis of the characteristics of the particular pair of adjacent stimulus events involved, such as their relative probabilities or spatial relationships. Although the procedure of collapsing or combining certain components of RT data simplifies calculation, findings reported by Remington (7) indicate that this type of averaging can lead to misleading interpretations concerning the repetition effect for two-choice RT data. Additional simplifying assumptions are normally made for sequential analysis of RT data from experiments involving more than two choices. The present paper examines the appropriateness of a number of such simplifying assumptions which have been made in previous studies.

B. METHOD

1. *The Subjects*

Five volunteer *S*s (three females and two males) participated in the experiment. The *S*s ranged in age from 15 to 28 years. All *S*s had previously participated in the two-choice RT experiment reported by Remington (6).

2. *The Apparatus*

The signals were presented by means of a visual display consisting of four lights approximately one inch in diameter. The stimulus display also contained a red warning light and a small green light used to provide *S* with knowledge of a correct response.

The response device was a small keyboard with four typewriter-like keys. The keys were numbered, starting on the left, 1-4 corresponding spatially with the numbered stimulus lights. The depression of a key following a stimulus light was followed by the automatic recording of the RT with millisecond accuracy, stimulus number, and the specific key(s) depressed by *S*. A fixed one-second delay between the onset of the warning light and the onset of the stimulus light was employed throughout the experiment.

The control and recording portions of the equipment, located in a room adjacent to the room containing the visual display, allowed for automatic data collection without the necessity of visual inspection or intervening operations by *E*. Stimulus presentations were automatically controlled by means of punched paper tape programs read by a paper tape reader. The relevant information for each trial (i.e., a record of the stimulus light presented, the response made by *S*, and the RT in milliseconds for the trial) was automatically recorded in digital form onto paper tape by means of an eight-channel paper tape punch. The entire interstimulus interval, consisting of (*a*) the foreperiod, (*b*) the stepping of the control tape, (*c*) the RT, and (*d*) the data recording, was about four seconds.

3. *The Stimulus Sequences*

All of the stimulus sequences used in the present experiment were 200-trials long. Randomization of the stimulus events was achieved by means of a computer program. Additional structural characteristics of the stimulus sequences are presented in the following description of the experimental conditions:

(*a*). *25:25:25:25 Condition.* Five different four-choice stimulus sequences were generated for the first experimental condition. Each of these 200 trial sequences consisted of equal numbers of the four stimulus alternatives.

(*b*). *40:20:20:20 Condition.* Five different four-choice stimulus sequences were also generated for this condition. In all five stimulus series, light "1" appeared on 40 percent of the trials, while each of the other three stimulus events appeared on 20 percent of the trials. Second and third order estimates of redundancy for the combined stimulus sequences were nearly zero for both conditions.

(*c*). *Simple Reaction Condition.* A special sequence was constructed for each of the four stimulus events such that a given stimulus light appeared on all 200 trials.

4. *Procedure*

Each *S* performed under all three experimental conditions. Presentations of the four-choice sequences were preceded by 40-trial practice sequences to introduce the subject to characteristics of each condition. During a typical experimental session, *S* was presented with four 200-trial stimulus sequences. Before each sequence, *S* was told the probability associated with the appearance of each of the possible stimulus events in terms of percentages. The *S*s were instructed to respond as quickly as possible to the presentation of the stimulus light without making more than 5 percent error responses during a given series.

5. *General Data Analysis*

Excluding the practice trials, a total of 14,000 data records (1000 for each *S* under each four-choice condition and 800 for each *S* under the simple RT condition) were collected during the course of the experiment. The RT associated with error responses (approximately 2 percent of the total number of four-choice responses) were included in the final data analysis.

The desired detailed sequential analysis of these data was only feasible with an electronic computer. A computer program was written that was capable of calculating and printing the desired statistics.

C. Results and Discussion

Instead of making a number of simplifying assumptions which would be needed to justify averaging over a number of components to arrive at a single value for the repetition effect it was decided to start with a detailed "tree diagram" analysis of a particular stimulus event for each experimental condition. A tree diagram analysis of RT data, introduced by Remington (6), consists of finding the mean RT for each of the possible stimulus patterns through a given order. In this way the validity of a number of assumptions that have been made by Falmagne (1) and others in their data analysis can be examined directly. The results of the tree diagram analysis of stimulus signal *1* (i.e., the light on the extreme left of the visual display) under the 25:25:25:25 condition are presented in Figure 1.

The RT associated with the first-order stimulus pattern indicated by the numeral "1" represents the mean RT across all *S*s for stimulus signal *1*. The RT associated with the second-order stimulus patterns "11" represents the mean RT across all *S*s for all presentations of stimulus signal *1* which were immediately preceded by a presentation of stimulus signal *1*. The RTs associated with the *second-order* stimulus patterns "21," "31," and "41" represent mean RT for all presentations of stimulus signal *1* which were immediately preceded by a presentation of signals *2*, *3*, and *4*, respectively. This type of analysis did not permit an adequate assessment of the mean RTs for all 64 fourth-order patterns. Therefore, the reported results are confined to the mean RTs associated with the 21 stimulus patterns through the third-order.

The results of this analysis, presented in graphic form, make it readily apparent that third-order stimulus patterns had an influence on RT, even a greater influence than was observed in either of the two-choice conditions reported by Remington (6). For example, it can be seen that the mean RT for stimulus signal *1* was much longer if it was immediately preceded by two presentations of signal *2* or signal *3* than if it was immediately preceded by two presentations of signal *1* (i.e., a difference of about 90 msec). The findings concerning the second-order sequential effects tend to cast doubt on the appropriateness of the customary procedure of pooling nonrepetitions in arriving at a single value to represent "the repetition effect" for conditions that involve more than two choices. Examination of the mean latencies associated with the second-order stimulus patterns in Figure 1 indicates the existence of differences be-

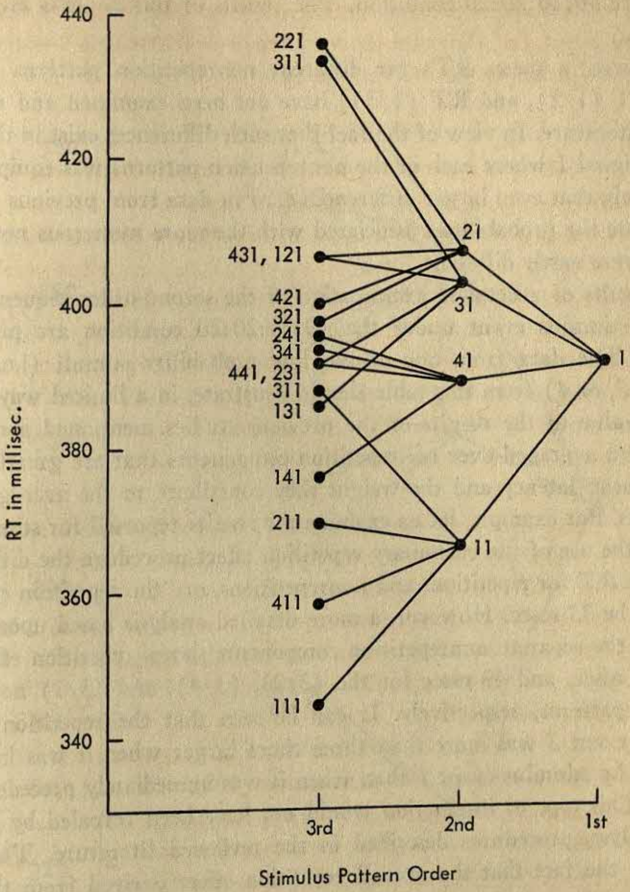

FIGURE 1
TREE DIAGRAM ANALYSIS FOR STIMULUS SIGNAL "1" UNDER THE 25:25:25:25 CONDITION

tween the nonrepetition patterns. Discussion of these differences is facilitated by the use of some new notation. Let RT (A/B) represent the mean RT for stimulus event A given that it is immediately preceded by stimulus event B. Applying this notation to the differences between nonrepetitions displayed in Figure 1 we would say that RT (1/4) was less than RT (1/2) or RT (1/3). Examination of RT (1/4) showed that RT (1/4) was less than RT (1/2) or RT (1/3) for every subject. The same pattern of differences among the nonrepetitions emerged when a tree diagram analysis was made for stimulus signal

1 under the 40:20:20:20 condition. The results of this analysis are presented in Figure 2.

Differences in mean RTs for different nonrepetition patterns [e.g., RT (1/4), RT (1/2), and RT (1/3)] have not been examined and reported in previous literature. In view of the fact that such differences exist in the data for stimulus signal *1* where each of the nonrepetition patterns was equiprobable, it is very likely that even larger differences exist in data from previous studies (1, 4, 5) where the probabilities associated with the more numerous nonrepetition patterns were vastly different.

The results of a detailed examination of the second-order sequential effects for each stimulus event under the 40:20:20:20 condition are presented in Table 1. The data from one of the low probability stimuli (i.e., stimulus events *2*, *3*, or *4*) from this table should illustrate, in a limited way, the questionable value of the results of the previous studies mentioned above if they have indeed averaged over nonrepetition components that are greatly different in both mean latency and the weight they contribute to the average for nonrepetitions. For example, let us examine the results reported for stimulus event *3*. With the use of the customary repetition effect procedure the difference between the RT for repetitions and nonrepetitions, or "the repetition effect," was found to be 33 msec. However, a more detailed analysis based upon the mean RTs for the separate nonrepetition components shows repetition effects of 16 msec, 23 msec, and 49 msec for the (3/2), (3/4), and (3/1) nonrepetition stimulus patterns, respectively. It can be seen that the repetition effect for stimulus event *3* was more than three times larger when it was immediately preceded by stimulus event *1* than when it was immediately preceded by stimulus *2*. This type of interaction would not have been revealed by any of the data analysis procedures described in the reviewed literature. These results illustrate the fact that the overall repetition effect derived from the conventional procedure can be very misleading if interpreted as a representative measure. No straight-forward interpretation of this particular index of second-order sequential effects should be made unless one has evidence that the mean RTs for the various nonrepetition stimulus patterns are equal. This becomes a particularly relevant consideration when a number of stimuli representing a wide range of stimulus probabilities make up a condition, such as the experimental condition used by Falmagne (1).

At first glance one might contribute the observed differences between RT (3/2), RT (3/4) and RT (3/1) to the differences in the probabilities associated with the stimulus events that precede the stimulus event *3*. That is, the

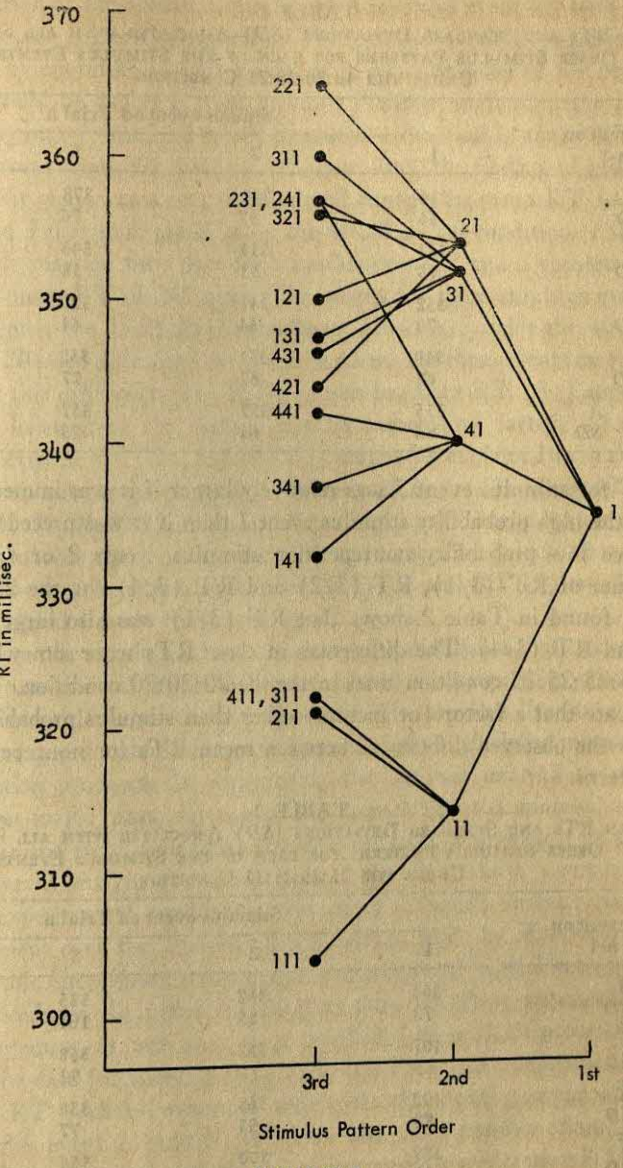

FIGURE 2

TREE DIAGRAM ANALYSIS FOR STIMULUS SIGNAL "1" UNDER THE 40:20:20 CONDITION

TABLE 1
MEAN RTs AND STANDARD DEVIATIONS (*SD*) ASSOCIATED WITH ALL SECOND-ORDER STIMULUS PATTERNS FOR EACH OF THE STIMULUS EVENTS UNDER THE 40:20:20:20 CONDITION

Stimulus event on Trial n-1		Stimulus event on Trial n			
		1	2	3	4
1	$\overline{X}$	314	341	378	380
	SD	54	67	76	77
2	$\overline{X}$	354	311	345	379
	SD	73	53	58	72
3	$\overline{X}$	352	341	329	386
	SD	70	64	61	80
4	$\overline{X}$	340	351	352	344
	SD	62	67	77	58
Column Marginals	$\overline{X}$	335	337	357	374
	SD	66	65	73	75

mean RT for stimulus event *3* was relatively larger if it was immediately preceded by the high probability stimulus event *1* than if it was preceded by either of the two low probability nonrepetition stimulus events *2* or *4*. However, examination of RT (3/1), RT (3/2) and RT (3/4) for the 25:25:25:25 condition found in Table 2 shows that RT (3/1) was also larger than RT (3/2) and RT (3/4). The differences in these RTs were somewhat smaller in the 25:25:25:25 condition than in the 40:20:20:20 condition. These findings indicate that a factor (or factors) other than stimulus probability are involved in the observed differences between mean RTs for nonrepetition stimulus patterns.

TABLE 2
MEAN RTs AND STANDARD DEVIATIONS (*SD*) ASSOCIATED WITH ALL SECOND ORDER STIMULUS PATTERNS FOR EACH OF THE STIMULUS EVENTS UNDER THE 25:25:25:25 CONDITION

Stimulus event on Trial n-1		Stimulus event on Trial n			
		1	2	3	4
1	$\overline{X}$	366	362	385	390
	SD	72	85	101	79
2	$\overline{X}$	407	332	358	394
	SD	85	71	92	78
3	$\overline{X}$	402	368	338	392
	SD	88	93	77	84
4	$\overline{X}$	389	390	366	358
	SD	82	88	94	73
Column Marginals	$\overline{X}$	392	363	363	384
	SD	83	87	93	80

Examination of the overall means for each stimulus event for both conditions (reported as the column marginals in Table 1 and Table 2) suggests a factor that might be operating in such a way as to produce some of the observed results. As would be expected from previous findings, increasing the probability of stimulus event *1* from .25 to .40 produced a decrease in mean RT for that particular event from 392 msec to 335 msec. But, the finding of most interest in the present section concerns the observed changes in mean RT for stimulus events *2* and *3* that took place under the 40:20:20:20 condition. Examination of the simple reaction time data for stimulus events *2* and *3* showed that they both had a mean RT of 241 msec. The means for these stimulus events were also equal under the 25:25:25:25 condition. However, under the 40:20:20:20 condition a 20 msec difference between the means for these events emerged. The direction of this difference [i.e., RT (2) was less than RT (3)] suggests that the spatial location of the signals was an influencing factor. That is, the difference between RT (2) and RT (3) might be explained in terms of the spatial correspondence of these signals to signal *1*, the biased signal. Perhaps under the 40:20:20:20 condition the "search pattern" begins at the left with the highly probable signal and proceeds to the right. It would be interesting to see whether or not the difference between RT (2) and RT (3) would reverse direction if signal *4* were the biased signal.

It should not be concluded from the foregoing discussion that one need only exercise caution in averaging RTs for second-order nonrepetition stimulus patterns. The interval analysis curves reported in the previous literature (viz., 1, 3) are also of questionable value as indicators of the underlying microstructure of the reaction processes. In introducing the interval analysis to study the recency effect in RT data, Hyman (3) presented interval analysis curves for his two, four and eight alternative conditions. Later, Falmagne (1) presented separate interval analysis curves for each of the six stimulus events employed in his one experimental condition. Although Falmagne's analysis represented an improvement over the relatively gross analysis made by Hyman, a number of questionable simplifying assumptions are associated with Falmagne's data analysis procedures. In order to illustrate and test these assumptions, Falmagne's procedure, as well as a more detailed data analysis procedure, were applied to the data for stimulus event *1*. Using Falmagne's procedure one first would find RT (ABA), where A represents the stimulus event of interest (viz., stimulus event *1*) and B represents any other possible stimulus events (viz., stimulus events *2*, *3*, and *4*). In the case under consideration RT (ABA) is the weighted mean of the means associated with the third-order stimulus patterns *121*, *131*, and *141*.

Under the 25:25:25:25 condition RT (ABA) for stimulus event *1* was 389 msec, which is only 3 msec lower than the overall mean for stimulus event *1*. Strictly speaking, RT (121), RT (131), and RT (141) should all equal about 389 msec, if this value is to be considered as representative of the RT associated with the stimulus pattern in which successive presentations of stimulus event *1* are separated by a presentation of another stimulus event. However, examination of the mean RTs associated with these stimulus patterns revealed substantial differences. The mean RTs ranged from 376 msec for the *141* pattern to 407 msec for the *121* pattern.

The next step in delineating the interval analysis curve for stimulus event *1* by Falmagne's procedure would be to determine RT (ABBA). The pooling procedure becomes even more questionable in this case, where we do not distinguish between patterns such as *1221*, *1331*, *1441* and the patterns *1231*, *1241*, *1341*, *1321*, *1421*, and *1431*. The mean RTs for these patterns were found to represent a wide range from 429 millisec. for the *1221* pattern to 377 msec for the *1341* pattern. The pooled mean, which would have been reported in the Falmagne type of analysis, was 393 msec.

D. SUMMARY

In general, the results of the present study support the major findings from the two-choice experiment reported by Remington (6) regarding the importance of higher order stimulus patterns in determining RT and the nature of the repetition effect. Similar to the two-choice findings the results from a detailed sequential analysis of four-choice RTs suggest that certain higher order sequential effects are as important as the more popular repetition effect (i.e., third-order sequential effects similar to the repetition effect in magnitude were found under both experimental conditions). Clearly, higher order sequential effects deserve similar study and treatment in any theoretical formulation advanced to account for sequential effects in choice reaction processes.

The results of the present study have definite methodological implications. Detailed examination of the four-choice data lends support to the position advanced by Remington (7) concerning the inappropriateness of the common practice of collapsing or averaging over components which make up an experimental condition. For example, the differential effects among the nonrepetition components found in the present four-choice data would not have been detected by the customary sequential analysis in which all nonrepetition components are pooled to arrive at a single value for nonrepetitions. Undetected differential effects among the nonrepetition components could easily lead to misleading interpretations regarding the nature of the repetition effect. The findings from the present study indicate that the appropriateness of certain simplifying assumptions should be empirically determined by a detailed sequential analysis of each component which makes up the experiment condition.

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ITEM FAILURE AND PERFORMANCE ON SUBSEQUENT ITEMS OF AN ACHIEVEMENT TEST*

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A. INTRODUCTION

Research into the detrimental effects of anxiety on performance (2, 3, 4, 5) leads one to predict that if the anxiety generated by perceived failure of an item were great enough, errors will perseverate, and a general decrement in performance will result. The present study was designed to examine this phenomenon in an achievement test situation under controlled, experimental conditions.

The following experiment was conducted to examine the hypothesis that perceived failure of one test item increases the probability of failure of the subsequent item when the difficulty of the subsequent item is controlled and that this phenomenon is more noticeable in students with higher chronic anxiety levels.

B. METHODS

1. *Subjects*

Subjects (*S*s) were 31 male and female students enrolled in an undergraduate developmental psychology class. *S*s were not aware that they were participating in an experiment, since the experimental manipulations and task were introduced in the form of a regularly scheduled class examination.

2. *Procedure*

Sixteen *S*s received at random Form A of an 80-item multiple choice exam, and 15 *S*s received Form B. Both forms contained two questions (#10 and #30) which did not have any correct alternative and two questions (#20 and #40) asking for information which *S*s could not be expected to know. Perceived failure on these questions was presumed inevitable. Both forms contained the same questions, but the four items which immediately preceded the difficult questions on Form A immediately followed on Form B, and vice versa. (The items preceding the difficult questions are called precritical items, and those following are postcritical items.)

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Three weeks after the examination, the Alpert and Haber (1) achievement anxiety test was administered to the class[1] under the guise of collecting survey data for a research project. No mention of any connection between this test and the earlier examination was made.[2] *S*s indicated the validity of 19 self-referential statements—e.g., "I look forward to exams" and "The more important the exam, the less well I do"—by checking a five-point scale of "always" to "never." The direction of the scales was randomly varied, and each was scored so that the higher the total score, the greater the achievement test anxiety.

C. RESULTS

Four scores were thus obtained for each *S:* total errors on the exam, number of precritical errors (errors on the four precritical items), number of postcritical errors (errors on the four postcritical items), and an achievement test anxiety score.

t-tests to determine the comparability of the two groups indicated no significant differences in total number of errors ($X_A = 13.0$; $X_B = 12.8$; $t = .19$; $df = 29$; $p > .10$), number of precritical errors ($X_A = .750$; $X_B = .533$; $t = .68$; $df = 29$; $p > .10$), number of postcritical errors ($X_A = .938$; $X_B = 1.200$; $t = .74$; $df = 29$; $p > .10$), or in anxiety scores ($X_A = 54.06$; $X_B = 56.20$; $t = 1.05$; $df = 29$; $p > .10$).

Analyses were performed to test the hypothesis that postcritical errors would be more probable than precritical errors. Only five *S*s made more precritical errors than postcritical errors; 12 *S*s made an equal number of pre- and postcritical errors, and 14 *S*s made more postcritical errors than precritical errors. Thus, there was a greater likelihood for *S*s to make at least the same number of pre- and postcritical errors ($\chi^2 = 2.88$; $df = 1$; $p < .10$) or, especially, to make more postcritical errors than precritical errors ($\chi^2 = 4.26$; $df = 1$; $p < .05$).

Considering all *S*s, there were more postcritical errors than precritical errors ($t\text{-corr} = 2.47$; $df = 29$; $p < .02$). However, this tendency was more noticeable in the Form B *S*s ($t\text{-corr} = 2.57$; $df = 14$; $p < .05$) than in the Form A *S*s ($t\text{-corr} = .82$; $df = 14$; $p > .10$); i.e., Form B *S*s were more affected by the critical questions than were the Form A *S*s.

All F-ratios of an analysis of variance to determine the degree of linear, quadratic, and higher-order relationships between achievement test anxiety scores and total exam errors indicated no significant relationship of any form between these variables.

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[1] Five *S*s were absent the day the anxiety test was administered and were tested individually at a later date. Because time of administration presumably has no effect on the scores (1), these scores are assumed to be comparable to the others.

[2] On the basis of the follow-up interviews with most of the class, we were assured that *S*s perceived no connection between the examination and the anxiety test.

Finally, *S*s were ranked in terms of anxiety scores, and this order was trichotomized into a Low anxiety group ($n_L = 11$), a Moderate anxiety group ($n_M = 10$), and a High anxiety group ($n_H = 10$). A chi square, computed between the trichotomized anxiety variable and the number of postcritical errors (zero, one, or two and three), was nonsignificant ($\chi^2 = 8.35$; $df = 4$; $p < .10$) by conventional standards, but recognizing the unreliability of the variable measures, a further analysis was performed on the extreme cells only. There were seven Low anxiety *S*s who made no postcritical errors, and one who made two errors; there was one High anxiety *S* who made no errors, and six who made two or three errors. The Fisher-Yates exact probability of this array was .0087, indicating a strong, positive relationship between anxiety and item failure. (A parallel set of analyses between anxiety scores and precritical errors generated only nonsignificant results, as expected.)

D. Discussion and Conclusions

These results indicate that a given item is failed more often when it immediately follows an extremely difficult question (on which perceived failure is presumed) than when it immediately precedes that question and support the hypothesis that failure of one item leads to failure of the immediately subsequent item. Furthermore, the hypothesis that this effect is more noticeable in students with higher chronic anxiety levels is supported. Theoretically, perceived failure increases momentary anxiety level beyond the optimal level for test performance, and error perseveration results.

In addition, although the data are equivocal on this point, it is interesting to note that the Form B *S*s were apparently more affected by the introduction of extremely difficult questions and had slightly higher chronic test anxiety scores than the Form A *S*s. It is suggested in line with the Yerkes-Dodson Law that the slightly higher anxiety of the Form B *S*s facilitated their performance on the precritical items, resulting in fewer precritical errors. However, the additional anxiety generated by failure increased momentary anxiety well beyond the optimal level for performance, resulting in more postcritical errors.

Several assumptions made in this study should be empirically verified in future research efforts. In particular, independent measures of perceived failure should be devised; an extremely difficult or impossible question was merely assumed to create a perception of failure. Further, independent measures of momentary anxiety following perceived failure should be devised; again, an increment in momentary anxiety was merely assumed to result from perceived failure. Finally, the optimal anxiety level for test performance should be determined in order that the data would have a direct bearing on the Yerkes-Dodson Law.

E. SUMMARY

This study indicated that the introduction of extremely difficult items in a multiple choice achievement test increases the probability of subsequent item failure. That is, when a student failed one item on a test, he was likely to fail the following item, regardless of the difficulty of that item. The results were interpreted as due to the detrimental effects of anxiety generated by failure on the difficult item.

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A FURTHER TEST OF JOHNSON'S "CHUNK-CODE" NOTION*

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A. INTRODUCTION

Johnson (2) has suggested that when subjects (*S*s) are required to remember a sequence of response elements, they do so by dividing the elements into chunks (4) and storing all information from a chunk in the same memory code. This "chunk-code" notion would suggest that if a chunk code were forgotten the *S* would be unable to produce any of the information represented within the chunk.

The "chunk-code" notion was tested by Johnson (2) using a retroactive inhibition (RI) procedure. It was reasoned that if an *S* were to store a sequence of elements—e.g., SBQ—in the same memory code and then learn another set of elements—e.g., SBJ—different codes would be needed for the two responses. If *S* attempted to use the original-learning (OL) code, he would be producing the OL response and be signaled that he had made an error. Assuming that *S* would need to use two codes, there should be RI of the OL code. According to the "chunk-code" notion, *S*s should be unable to recall the changed and unchanged letters from the OL response.

In Johnson's study, the *S*s learned sequences of three chunks of three letters each as paired-associate (PA) responses (e.g., SBJ, FQL, ZNG). A blank space appeared between the third and fourth letters and between the sixth and seventh letters of each response. The stimuli were single digits and each *S* learned two PAs. An examination of transitional error probabilities (3) for OL performance indicated that *S*s were using the blank space as a means of organizing the response into chunks. After OL the experimental *S*s had an interpolated-learning (IL) task which was identical to the OL task except that one letter in each of two chunks was changed; the control *S*s performed a symbol cancellation task after OL. After IL the experimental *S*s recalled OL and IL responses using the modified-modified-free-recall (MMFR) technique (1); the control *S*s recalled the OL responses. In recall of OL responses, the experimental *S*s recalled significantly fewer changed and unchanged letters from

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changed chunks than did the control, while the two groups did not significantly differ in their recall of letters from unchanged chunks. These results are supportive of the "chunk-code" notion. In addition, the experimental-control difference for changed letters of changed chunks was greater than the experimental-control difference for unchanged letters of changed chunks. This result suggests that there may have been some unlearning during IL of the association between the OL code and the changed letter of the OL response.

The present study further examined the validity of the "chunk-code" notion with the use of an RI procedure similar to the one used by Johnson. In the present study the experimental *S*s learned two PA lists. The stimuli of the lists were single digits and each response consisted of three consonants (no blank spaces appeared within the responses). Each PA in OL was nearly identical to a PA in IL (e.g., 2 RVH and 2 RCH); the only difference between the two PAs in each case was the middle letters of the two responses. After IL *S*s recalled both OL and IL responses using the MMFR technique. After *S*s indicated that they were finished with the recall test, they were given a different colored pencil and asked to guess on recall test blanks where they had not attempted to supply a letter.

If, in the above design, the OL response is stored in memory by a single code and IL produces unlearning of the PA stimulus to OL code and OL code to OL middle letter bonds, specific patterns of correct (C) and incorrect (N) letter recall for the OL response should occur before and after guessing on the MMFR. First, the experimental *S*s should produce more complete errors (NNN) than a control group which does not learn the IL list; second, there should be more occurrences of CNC error patterns for the experimental than for the control group which does not learn the IL list; third, the experimental group should not differ from the control in the five remaining error patterns which can be made—CNN, CCN, NCN, NCC, and NNC.

B. METHOD

1. *Subjects*

The *S*s were 40 introductory psychology students at the University of Kentucky. They were assigned in alternating order to the experimental and control groups.

2. *Materials and Procedure*

Two OL and IL paired-associate lists were constructed. One half of the experimental group learned one of the OL and IL lists (set A), while the other half of the group learned the other OL and IL list (set B). All lists were presented by the standard anticipation technique at a 2:2 second rate wit 2 second intertrial interval until a criterion of one perfect trial was reache Five orders in which the PAs appeared within the list were used with each li For each of the OL and IL lists, the stimuli were the single digits 2 to while each response consisted of three consonants. The responses were co structed from the Underwood and Schulz (5) letter-association norms su that adjacent response letters had zero to near zero associative probabilities. T responses of the OL and IL lists of set A were RVH, DMQ, FXP, NT WKB, and RCH, DSQ, FGP, NZL, WJB, respectively; the responses the OL and IL lists of set B were BXG, JCW, DQK, NVZ, TLH, an BMG, JSW, DFK, NRZ, TPH, respectively. In each set of lists, each PA i the OL list was nearly identical to a PA in IL; the only difference betwee the two PAs was the middle letters of the two responses. To control fo formal intralist similarity, no letter was used more than once in the response learned by an experimental group.

Each control *S* learned the OL list learned by the preceding experimenta *S* and then performed a symbol cancellation task for a period of time whic matched the time required by the preceding experimental *S* to learn the IL list. In the symbol cancellation task, the *S*s were presented a series of symbol and numbers at the top of a sheet of paper. They were told that each symbol represented the number below it. The symbols were again presented further down the page in random order with each symbol occurring a number of times. The *S*s were asked to cross out each symbol and write below it the number which the symbol represented. The *S*s were allowed to refer to the top of the sheet throughout the task.

After IL the experimental *S*s were asked to recall the OL and IL responses using the MMFR procedure. The *S*s were supplied a sheet of paper on which the PA stimuli were listed. They were asked to supply the responses from both lists on two sets of three blanks next to each stimulus. After *S*s had written down their responses, they were asked to identify the list to which each response belonged. The control *S*s were asked to supply the responses from the OL list on one set of three blanks next to each stimulus. After *S*s indicated that they were finished with their recall, they were given a different colored pencil and asked to guess on blanks where they had not attempted to supply a letter.

C. RESULTS

The mean number of trials to criterion for the experimental and control groups was 22.5 and 26.2, respectively, $t(38) = 1.20$, $p > .05$.

The MMFR results for the OL responses are presented in Table 1. The results include the frequency of occurrence of each type of error pattern before and after guessing for the experimental and control group. For the preguess results, there was a significantly higher occurrence of NNN and CNC errors for the experimental than for the control group, $t(38) = 4.07$, $p < .05$ and $t(38) = 2.26$, $p < .05$, respectively. However, the experimental group did not significantly differ from the control in the five remaining error patterns—$t_s\ (38) = .47, .41, .82, .00$, and $.00$, for CNN, CCN, NCN, NCC, and NNC, respectively, $p > .05$. For the postguess results, there again was a significantly higher occurrence of NNN and CNC errors for the experimental than for the control, $t(38) = 3.22$, $p < .05$, and $t(38) = 2.96$, $p < .05$, respectively. The experimental group did not significantly differ from the control in the other error patterns—$t_s\ (38) = .31, .41, 1.41, .54$, and 1.00, respectively, $p > .05$.

D. Discussion

The results suggest that the OL response was stored in memory by a single code and IL produced unlearning of the association between the PA stimulus and OL code and unlearning between the OL code and OL middle letter. As predicted, the experimental group in recalling OL responses produced more NNN and CNC errors than the control before and after guessing; in addition, the experimental group did not significantly differ from the control in any other pattern of correct and incorrect letter recall. In general, these results are supportive of the "chunk-code" notion.

One additional point ought to be mentioned about the results. The results are not supportive of the hypothesis that *S*s learn a PA response by forming associations between adjacent response elements (i.e., a chaining hypothesis). Since the middle letter of the OL response was experimentally submitted to RI, the hypothesis would have to predict that the experimental *S*s have pro-

TABLE 1
THE FREQUENCY OF ERROR PATTERNS MADE DURING OL RESPONSE RECALL

Error patterns	Before guessing		After guessing	
	Experimental	Control	Experimental	Control
NNN	39	4	30	4
CNC	12	4	15	2
CNN	6	4	5	4
CCN	3	2	3	2
NCN	1	0	2	0
NCC	1	1	2	1
NNC	1	1	4	1

duced more CNN errors than the control; however, the experimental group should not have differed from the control in any other error pattern. These results were not obtained.

E. Summary

The present study tested Johnson's (2) "chunk-code" notion using a retroactive inhibition technique. An experimental group of *S*s learned two paired-associate (PA) lists. In each list the stimuli were single digits and each response consisted of three consonants. Each PA in the original-learning (OL) list was nearly identical to a PA in the interpolated-learning (IL) list. In each case, the only difference was the middle letter of the two responses (e.g., 2 RVH and 2 RCH). After IL, the *S*s recalled OL and IL responses using the modified-modified-free recall technique. A control group learned the OL list, performed a symbol cancellation task for the duration of IL, and then recalled the OL responses. As predicted, the experimental *S*s in recalling OL responses made significantly more complete errors on the middle (changed) response letter than did the control.

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SELECTED PERSONALITY CHARACTERISTICS OF HIGH SCHOOL ATHLETES AND NONATHLETES*

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A. INTRODUCTION

According to some researchers, athletes possess different personality traits from nonathletes. Although, the search for these personality differences has been frustrating as some psychologists contend that the validity of research done prior to the 50's is questionable as a result of unreliable test equipment, weak statistical analysis, and the techniques used in grouping. (3, 4)

The purpose of this study was to determine differences in high school athletic participants and nonparticipants in selected personality characteristics.

In reviewing the literature of personality differences of college football players and nonfootball players, football participants were found to be more outgoing, and socially aggressive than the nonparticipants. Research also indicates that highly successful teams tend to demonstrate a higher score on sociability than the losing teams. The winners possessed better scores in dominance and leadership characteristics than the losers.

It was also found that the team sport athletes were steady, practical, dependable, and interested in immediate issues. They were found to be self-reliant, responsible, and emotionally disciplined. The team sport athletes were less affected by fads, were realistic, and tended to generate group solidarity. (2, 5, 6, 8, 9)

A study by Behrman (1) of personality differences between college age nonswimmers and swimmers revealed that there were significant personality differences between the swimmer and nonswimmer. The nonswimmer tended to be more shy and seclusive than the swimmers, who were more sociable and outgoing.

In a study of the behavioral characteristics of little league players, Seymour (7) found that boys who take part in little league baseball develop a higher level of social acceptance earlier than do nonparticipants. He also contended that the participant exhibited higher social adjustment with his peers than did the nonparticipant.

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B. METHOD

Data for this study were obtained from 950 male college freshman students enrolled in Texas A & M University's required freshman physical education "concepts" course during the fall and spring semesters of the 1968-1969 school year.

The Edwards Personal Preference Schedule was the psychological measuring instrument used in the study. It is designed to describe the personality by ascertaining the needs for Achievement, Deference, Order, Exhibition, Autonomy, Affiliation, Intraception, Succorance, Dominance, Abasement, Nurturance, Change, Endurance, Heterosexuality, and Aggression.

An Information Check List developed by the investigator also was used in this investigation. This instrument contained a list of 37 activities for the purpose of determining high school athletic participation and nonparticipation.

C. RESULTS

The differences in personality traits between athletes and nonathletes was determined by use of the independent *t* test. The results of this test indicated that the athletes scored higher than the nonathletes on the traits Dominance and Aggression and the nonathletes scored higher than the athletes in Order.

D. DISCUSSION

To the degree that this sample is representative of students in general, the following conclusions seem pertinent: (*a*) High school athletes tend to be more aggressive and dominant than nonathletes, (*b*) Nonathletes tend to be more orderly and organized than athletes.

In summary, it can be said that differences in personality characteristics exist between athletes and nonathletes. However, a long range study should be conducted to determine the effect of activity participation on personality characteristics.

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THE EFFECT OF FEEDBACK ON THE CONTROL OF CARDIAC RATE*

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A. INTRODUCTION

The primary purpose of this investigation was to determine whether a visual feedback procedure first used by Hnatiow and Lang (10) to stabilize heart rate (HR) could be used to decrease HR as well. A second aim was to determine the extent to which the observed HR change was related to three other physiological variables, two of which are felt to reflect mediation of learned cardiac behavior.

The present area of investigation is an outgrowth from a series of studies concerned with the problem of instrumental learning of autonomically controlled visceral responses. Prior to the recent interest in this area, it was widely assumed that autonomic responses were subject to modification only by classical conditioning procedures. Studies attempting to modify cardiac rate using primary or secondary reinforcers are exemplified by the rat studies of Miller (5, 19, 20) and Trowill (24) and by the human studies of Engel and Chism (7), Engel and Hansen (8), Frazier (9), Levene, Engel, and Pearson (15), and Shearn (22). Sharing the same theoretical framework as the instrumental conditioning approaches are the feedback studies which have attempted to modify cardiac function in the absence of primary or secondary physical reinforcers. The only reinforcement provided by the feedback approach is the immediate knowledge of having just made a correct or incorrect response. The cardiac feedback approach has been used by Brener and Hothersall (1, 2), Brener, Kleinman, and Goesling (3), Donelson (6), Hnatiow and Lang (10), Lang, Sroufe, and Hastings (13) and Sroufe (23).

Hnatiow and Lang (10) and Lang *et al.* (13) have shown that heart-rate variability (HRV) can be decreased when appropriate instructions are given in the use of correct cardiac feedback. No attempt was made in the Lang studies to decrease HR, although a number of other studies, notably those of Brener (1, 2, 3), suggest that HR may be decreased through feedback. Unfor-

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tunately, in the Brener studies it is difficult to be certain whether HR was increased, decreased, or both, as HR decreases are shown relative to instructed HR increases and vice versa.

The demonstration of HR slowing has become an important methodological problem, since evidence has been reported by Engel and Chism (7) and Levene *et al.* (15) that HR speeding is easier to learn than HR slowing. Because the feedback procedure of Hnatiow and Lang (10) and Lang *et al.* (13) has been successfully used to demonstrate stabilization of HR, the possibility exists that the procedure may be used to decrease HR as well.

The Lang feedback procedure has the advantage of simplicity over other feedback and instrumental conditioning procedures used to modify cardiac functions. The only requirement is a monitoring device to inform the *S* almost immediately of every minute change in his HR. This requirement is easily met by providing the *S* visual access to a voltmeter connected across the pen motor of a polygraph.

With the use of the feedback procedure described above, the following question was investigated: Is HR susceptible to decremental modification through correct feedback when *S*s are given instruction for the decrement of HR?

B. METHOD

1. *Subjects*

Twenty paid volunteers of both sexes between 16 and 30 years of age were recruited from schools, universities, and employment agencies. The *S*s were randomly assigned to one of two feedback groups, 10 *S*s in each group.

2. *Design*

The design included two experimental groups (correct feedback and incorrect feedback); two feedback display conditions (display and no display); and 10 trials (5 display and 5 no display). The dependent variable was HR in beats-per-minute (bpm). The variables respiration rate (RR) and skin conductance (SC) were recorded as controls against the possibility of respiratory or arousal mediation of cardiac changes going undetected.

3. *Task and Apparatus*

The *S*'s task was simply to observe the feedback meter according to the instructions given. No other duties were to be performed.

The correct feedback (CF) display apparatus consisted of a voltage meter in parallel circuit with the pen of a Beckman Dynograph which was being driven by the amplified signal of a Beckman cardiotachometer, so that beat-to-beat changes in HR were represented on the meter face. The full visual range of the meter was 80 bpm. Each *S*'s resting HR level was set near the center of the meter face. The voltage meter for the incorrect feedback (IF) group was again driven by the amplified output of a Beckman cardiotachometer, which was converting a tape-recorded EKG of 75 ±8 bpm into a histogram signal.

The purpose of the IF group was twofold: first, to attempt to control for the unconditioned effect on HR of attending to an external stimulus, as decribed by Lacey, Kagan, Lacey, and Moss (12); second, to receive a feedback signal roughly comparable to that received by the CF group with regard to number of reinforcing stimuli (HR decrements). However, reinforcement in the IF group was nonresponse contingent.

The same tape-recorded IF signal was shown to all *S*s in the IF group. The rationale for using a single IF signal instead of the traditional yoked-control procedure was based upon the argument presented by Church (4). According to Church, when the unconditioned effect of the reinforcing stimulus affects the paired *S*s unequally, due to individual differences, there will be a bias in favor of the experimental member over the yoked control. Thus, a better experimental *S* will improve at the expense of a poorer control, but a better control will not improve when yoked with a poorer experimental. In consideration of Church's position, an attempt was made to minimize the bias in favor of the CF group. This was done by providing control group *S*s with a HR signal which, while falling within a range considered normal for both rate and variability in humans, appeared to be loaded with HR decrements, assuring that the IF *S*s would experience an abundance of positive reinforcement.

Silver-silver chloride electrodes were used for HR and SC recordings. Two cardiac electrodes were placed, one on the left side at approximately the second or third intercostal space and the other referred to the back of the neck. Skin conductance was recorded from the middle palmar segments of the second and third digits of the right hand. Respiration rate was recorded from a strain gauge strapped around the chest.

4. *Procedure*

There were five display (D) and six no-display (ND) trials, beginning and ending with no display. After approximately 20 minutes of rest, which included the first ND trial, the meter display of either correct or incorrect cardiac feedback was presented for five minutes followed by five minutes of no display during which the meter became inactive. The final ND trial (ND_6) was not included in the analysis of variance (ANOVA) design.

Subsequent to electrode placement, *S*s in the two feedback groups were given identical instructions concerning the use of the meter. Instructions were given to all *S*s in the presence of correct feedback for both CF and IF groups. None of the *S*s were told prior to or during the experiment that they were to decrease heart rate. They were told to attempt to keep the activity of the bodily function shown on the meter at as low a level as possible. The *S*s were informed that when the pointer of the meter went to the low side of the scale, the meter was telling them, in a sense, to continue that thought, state, or thing which they may have perceived within themselves at the moment the pen moved in that direction. Thus, the only reinforcer provided was the immediate knowledge of having just made a correct response. No other tactics were suggested to the *S*s, other than warning against attempts to control by respiratory or muscular changes. They were told to simply breathe in and out and to avoid taking deep breaths, holding their breath, or breathing in other peculiar ways. They were instructed not to try to lower the pen on the scale by adjusting their posture or flexing their muscles. The *S*s were told that there would be alternate times when they would be receiving and not receiving feedback and that when feedback was not available, control should continue to be exerted.

5. *Data Analysis*

The scoring of HR was performed as described by Malmstrom, Opton, and Lazarus (18), who used a modification of the scoring procedure employed by Lazarus, Speisman, and Mordkoff (14). Specifically, one HR value was read from an *S*'s record at each 15-second interval. A sampling of 12 absolute measures was taken from each D and ND trial, thus spanning a time period of three minutes. From the 12 data points, a mean HR and a standard deviation score were derived. This scoring procedure provides a suitable estimate of HR and is also quite sensitive to HRV. For the 11 trials, 132 data points were obtained.

The two remaining minutes of unanalyzed record from each D and ND trial were reserved for scoring when respiratory inspiration-expiration cycle deviations occurred. When a respiratory deviation did occur during a sample period, that point was skipped and the remaining readings shifted forward 15-seconds. A respiratory deviation was defined as one in which the inspiration-expiration cycle increased or decreased more than approximately 33% of its average duration in the previous D or ND trial. Further, any sudden changes in respiration amplitude greater or less than approximately 33% of the average amplitude in the previous D or ND trial were defined as respiratory deviations. This definition allowed for base-rate respiration changes but ruled out phasic alterations such as breath-holdings, gasps, sighs, and the like.

Respiration rate and SC level were analyzed for the same 3-minute perio in which cardiac activity was scored. Respiration rate was determined by counting the number of inspiration-expiration cycles within the 3-minute tim period. Skin conductance was scored in μ-mho units for the 3-minute perio using a planimetric integration procedure described by Shaw (21).

In order to equate initial baseline (trial ND_1) group differences (which, though nonsignificant, were perpetuated throughout the remaining 10 trials) the 11 mean HR scores for each S were converted to T scores. This was done by first finding the mean and standard deviation of the 11 trial means for each individual S. The derived mean and standard deviation for each S were then used to compute a T score distribution, so that a T score value was assigned to each S's 11 mean HR scores.

C. RESULTS

1. *Heart Rate*

The results for the control of HR are presented in T score form in Figure 1, which shows that Ss of the CF group reduced their HR during the D trials, whereas the IF group did not. During the ND trials, HR increased in the CF group and decreased in the IF group.

The results for HR were submitted in T score form to a three-way ANOVA with repeated measures on two factors. The analysis showed that the Group × Display interaction was statistically significant ($F = 8.0$, $df = 1/18$, $p < .05$), indicating that the CF and IF groups were responding in opposite directions to the feedback treatment. None of the other effects were found to be statistically significant. The significant interaction was reduced to simple effects analysis, which indicated that both D and ND differences (between group comparison) for groups were significant beyond the .05 and .01 levels, respectively ($F = 6.7$ and 7.7, $df = 1/36$). The mean T score for D in the CF group was 48.2 (HR = 72.1 bpm) and in the IF group, 51.8 (73.6 bpm). For ND the mean T score in the CF group was 53.4 (73.8 bpm) and in the IF group, 49.5 (72.8 bpm). Simple effect analysis of D *versus* ND (within groups) revealed that for the CF group, HR on D trials was significantly lower than on ND trials ($F = 6.9$, $df = 1/18$, $p < .05$). However, for the IF group the D *versus* ND comparison was not statistically significant ($F = 1.9$, $df = 1/18$).

Similar to the findings of previous instrumental conditioning and feedback studies of cardiac activity modification, the extent of change in terms of raw scores was not large. For example, the largest HR difference occurred between ND_4 and D_4 in the CF group, but the mean HR decrease was only 3.8 bpm.

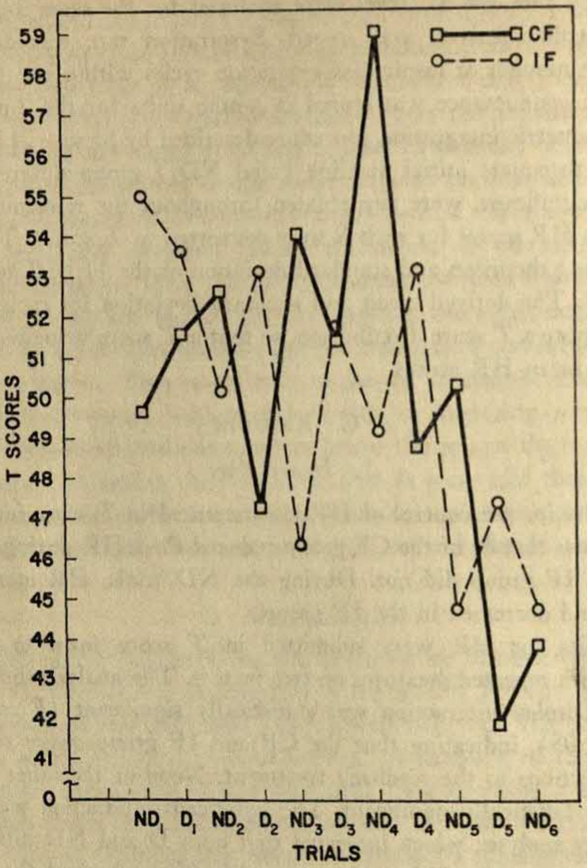

FIGURE 1
Group Mean in T Scores for Feedback Control of Cardiac Rate During D and ND Trials

In terms of *T* score differences based on the HR distribution of 11 trials, this raw score difference may assume greater biological significance. Heart rate decreased 10.2 *T* scores or one-plus standard deviation, representing a decrease of 38% in HR.

In an attempt to demonstrate a learning or acquisition curve for HR decrement over trials, nonparametric trend analyses (16) were conducted on the ND to D difference scores for CF and IF groups. The results of these analyses failed to reveal any significant trends. Thus no evidence for a learning curve could be found.

2. *Covariation of Other Response Variables*

The problem of covariation of HRV, RR, and SC was examined by first-order partial correlation analysis holding trials constant while correlating HR with the various response systems in question. Partial correlations were computed since it was apparent that all variables were correlated with trials. The partial correlations were computed for each individual *S* in the CF and IF groups: (*a*) for all 11 trials, D and ND combined, (*b*) for the five D trials, and (*c*) for the six ND trials. The partial $r_{12.3}$ for each *S* was transformed to a Fisher's *z* value. An estimate of the true partial correlation was then obtained by finding the mean *z* value for the CF group and for the IF group. A zero-Mu *t* test was computed on each distribution of *z* values in order to determine if the estimated partial correlation for either the CF or IF group differed significantly from zero. This procedure represents a within-group analysis and provides a powerful means of evaluating covariation of auxiliary variables.

Regarding possible covariation of HRV with HR, estimated partial correlation analysis of D plus ND, D only, and ND only, did not reveal any significant estimated partial correlation values. Similarly, estimated partial correlation analysis of HR and RR revealed nonsignificant covariation. However, analysis of HR with SC level in the CF group revealed a significant estimated partial correlation ($r_{12.3} = .62$, $p < .05$) on D trials. Other analyses were not significant.

3. *Postexperimental Interview*

Brief postexperimental interviews were conducted with each *S*. Perhaps the most striking finding of these interviews was that none of the 20 *S*s were aware that cardiac activity was involved in any way. This finding is understandable in view of the fact that cardiac feedback was presented via cardiotachograph in histogram form rather than through the direct EKG mode in pulse form. When *S*s were asked whether or not they successfully controlled their bodily function, approximately 75% of both CF and IF groups reported success. An examination of the individual records indicated that CF *S*s claiming no control were as successful as those claiming some control. Likewise, IF *S*s claiming some control were as unsuccessful as those claiming no control. Answers pertaining to how the *S*s attained control were diverse. However, most said all they did was watch the meter as instructed. When *S*s were asked if they felt frustrated in their attempts to gain control over the physiological function, only two responded positively and both were in the CF group.

D. DISCUSSION

The results of the present investigation clearly indicate that *S*s are able to decrease HR when correct feedback is available. Successful CF HR decrement was demonstrated to occur both within (D *versus* ND in the CF group) and between (CF D trials *versus* IF D trials) groups. The absence of a significant difference between D and ND trials in the IF group suggests that the results cannot be fully explained as the unconditioned effect on HR of attending to an external stimulus.

Although the D and ND trial differences in the IF group were not statistically significant, the IF group did show a tendency toward increased HR on the D trials relative to the ND trials. It is possible that *S*s were not attending to the incorrect feedback but were either pondering or rejecting it. Lacey *et al.* (12) have shown that HR does tend to increase when the *S* is pondering or rejecting a stimulus input. A second possibility is that the IF signal frustrated the *S*s, but in the absence of signal they were able to decrease HR as instructed. However, as noted above, frustration was not reported in the postexperimental interview. On the contrary, the majority of the IF *S*s felt they successfully performed their task. The extent to which the observed nonsignificant increases, on D relative to ND in the IF group, are due to the nature of the incorrect feedback cannot be determined from the results of this study. Perhaps if a yoked-control procedure had been employed, the observed response tendency would not have occurred in the IF group. This problem merits further investigation.

A specific influence on HR did not occur in the CF group as indicated by the significant positive estimated partial correlation between HR and SC for D trials. Thus, the greater the decrease in HR, the greater the decrease in SC level. This finding may be interpreted as consistent with the possibility that arousal mediation or mediation of HR by relaxation occurred on the D trials. The implication of this interpretation is that HR and SC changes occurred as a result of a common central nervous system mediating mechanism. It does not seem likely that SC changes could induce changes in HR. It is also doubtful that the feedback-induced HR changes mediated SC changes, since SC would be expected to increase on ND trials, and this did not occur.

Two previous studies (6, 9) have recorded electrodermal activity while attempting to modify cardiac activity through instrumental conditioning or feedback procedures. The only significant electrodermal finding of the Donelson (6) study was an increase in skin resistance over trials. This increase was accompanied by a decrease in HR over trials, thus suggesting that Donelson's findings were largely influenced by adaptation effects. Frazier (9) reported SC changes accompanying HR changes, but these parallel changes occurred under threat of shock, a finding which is not at all unusual. In the present investigation, the finding of an association between SC and HR is of considerable import. The importance of this result is achieved in consideration of the fact that this is the first time an ANS variable, not subject to voluntary control (except under certain experimental conditions), has been implicated, in the absence of aversive conditioning stimuli, in the mediation of cardiac activity.

The finding of no covariation of HRV with HR indicates that decrement of HR has no influence on HRV. It is also apparent that *S*s did not attempt to decrease HR by altering RR. It should be pointed out that this study is able to make only a very limited contribution as to how HR changes were mediated. The mediation problem has led Katkin and Murray (11) to state that instrumental ANS conditioning has not been demonstrated definitively in humans, although it has in the curarized rat studies. Katkin and Murray have seemingly forced the issue by their statement that the distinction between conditioning and control of the ANS may be superfluous, and that it is probably impossible to demonstrate the pure phenomena of instrumental conditioning in humans. In view of the limited number of variables recorded in this investigation and in consideration of Katkin and Murray's position, it must be concluded that HR decrements were controlled in this study and not necessarily influenced directly through conditioning. The findings for SC support this conclusion.

The study of mediational variables is important in that it offers a means of revealing the successful strategies used in the control of autonomic functions. Two methodological implications regarding the investigation ot mediational variables arise from this study. First and most obviously, SC measures, as well as other autonomic and somatic variables, should be obtained whenever HR feedback or conditioning studies are attempted. Second, a covariance within-group statistical procedure is required to extract a relationship between two or more variables across trials. Such a statistical procedure may be used to control for habituation effects. In the present study, an analysis parallel to that used for cardiac rate (ANOVA) would not have detected the SC changes noted.

The finding that controlled decrement of HR was not maintained on the ND trials for the CF group fails to agree with the finding of Brener *et al.* (3) that cardiac decrement may be maintained in the absence of feedback. Hnatiow and Lang (10) and Lang *et al.* (13) observed HRV increments on ND trials relative to D trials. They postulated that further trials might produce a more lasting effect leading to a reduction of the ND trial increments. In the present study, four additional trials, two D and two ND, were given relative to the Lang investigations. It is apparent from the data presented in Figure 1 that the latter ND trials are still characterized by HR increments relative to the D trials. It is recognized, however, that the addition of two D trials does not represent a significant amount of overtraining. A problem related to the lack of transfer to ND trials was encountered by Miller and DiCara (20), who found that curarized and artificially respirated rats changed overall HR in the rewarded direction during both discriminative stimulus (S^d) and non-S^d periods. This finding was interpreted as indicating that the rats were failing to discriminate between the two conditions. With additional trials, discrimination was achieved. In view of Miller and DiCara's findings, it is possible that the lack of transfer to the ND trials in the present study represents successful discrimination between S^d (D trials) and non-S^d (ND trials) periods.

In most instrumental conditioning and other learning situations, a learning or acquisition curve may be shown over repeated trials. Surprisingly, in the present study evidence of a learning curve was not found. Since it is apparent that correct feedback was effective in producing the desired cardiac responses, it must be concluded that learning did occur at some point in the study. It has been reported in a number of previous investigations (7, 8, 10, 13) that a learning curve did not occur during cardiac training. Since correct performance did occur as early as the first trial in each of the investigations cited, one trial learning appears to offer the most tenable account of the results. In other words, control of cardiac rate is learned very rapidly. However, it is possible that a learning curve might have been demonstrated had this study been repeated over several days for each *S*, rather than testing each *S* only once. Thus, it is possible that a much greater degree of control could be established over a more prolonged training period. Additional research is required in this direction.

The results of this study, considered with those of other studies attempting to modify cardiac activity through operant or feedback procedures, indicate that humans can decrease their cardiac rate to a limited degree. On the basis of associated SC changes, it is possible that the *S*s in this study successfully decreased their HR by adopting some sort of arousal or relaxation strategy. However, this could not be confirmed by postexperimental interviews. The question of whether cardiac or other autonomic changes occur under suitable reinforcing conditions outside the laboratory remains unanswered. It is tempting to speculate beyond the available data that such change may occur in "real life" and that, with the proper reinforcement contingencies, individual response stereotypy and even symptom specificity (17) could be learned or unlearned. With further refinements in reinforcement and/or feedback techniques, a powerful new therapeutic tool may ultimately become available to the clinician confronted by psychosomatic disorders.

E. Summary

The effect of visual feedback on the control of cardiac rate was examined under two experimental conditions: correct and incorrect cardiac feedback. Twenty human *S*s were studied, 10 in each feedback condition, over five feedback display and six no-display trials. The *S*s were not told to attempt to decrease cardiac rate. Rather, they were instructed to reduce the activity of the "physiological function" they were being shown to as low a level as possible on the feedback display apparatus. The results indicated that cardiac rate was significantly reduced in the correct feedback group during the display trials relative to the no-display trials and relative to the display trials of the incorrect feedback group. Palmar skin conductance was found to be positively correlated with cardiac rate during the display trials in the correct feedback group. From these results it may be concluded that humans can decrease their cardiac rate under the condition of correct visual feedback of cardiac activity. In view of the associated skin conductance changes, it is possible that the *S*s successfully decreased their cardiac rate by adopting some sort of arousal or relaxation strategy.

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AN ATTEMPT TO DRAMATIZE THE "DOUBLE-BIND" HYPOTHESIS OF THE SCHIZOPHRENOGENIC FAMILY*

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A. PREFATORY NOTE

This script on the schizophrenogenic family was written under the sponsorship of Gregory Bateson and Jay Haley in an attempt to dramatize the "double-bind" theory of the etiology of schizophrenia (2). Although dramaturgically primitive and of unknown validity in terms of the nonpublic processes in what are presumed to be real schizophrenogenic families, this script is presented here because it is a device that may permit direct apprehension of the theoretical phenomenology of such processes. It is also a method that can provide a concrete point of departure for theoretical discussions of the basic nature of the nuclear units of interaction within such a milieu.

Under the title "Family Sketches" this script was enacted and televised on the San Francisco Westinghouse station KPIX as a segment of an hour-long mental health program.[1] The telecast deviated from the writer's intent in that the television director made the schizophrenogenic family more ostentatiously morose than was theoretically necessary. In contrast, the writer had stipulated the following stage direction: "Except for parts of the dialogue, there should be identical elements in the nonschizophrenogenic and the schizophrenogenic sketches. In the schizophrenogenic sketch, the daughter's deviant behavior must be seen to be the direct consequence of an impossible situation; there must be no change in makeup, lighting, etc., to suggest pathology. The only inappropriate element in the schizophrenogenic sketch should be the incongruity of dialogue, gesture, and mood in the light of the context upon which the parents should be focusing." Also, explanatory narration that preceded and followed the sketches was paraphrased or condensed during the telecast, but it is included here in its entirety.

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[1] The Fine Line. San Francisco: KPIX, August 18, 1959. A motion picture of this telecast is available for a fee from the Mental Research Institute, 555 Middlefield Road, Palo Alto, California 94301.

By enacting and evaluating this script, the reader will have the opportunity to experience and discuss events that conform not only to the double-bind hypothesis of schizophrenia-involved family interaction, but also to theories associated with Bowen, Cheek, Farina, Laing, Lidz, Searles, and Wynne, as recently presented in Mishler and Waxler (3). If one views the parents in the script as (pre-)schizophrenic, or the daughter as already subacutely schizophrenic, support may be adduced even for a purely organic etiology. The script may also be interpreted in the light of Bateson's newly-presented formulation that the essence of schizophrenia is that of one of the "transcontextual syndromes," in particular a genetic disability in coping with the double bind, whereas the double bind itself is pathologically neutral (1).

The script ends with the words "the work on this has only begun." After a decade and hundreds of articles and books on the family role in schizophrenia, this is still the case.

B. The Script

NARRATOR: You will now see two sketches which have been especially written for this program and which are pure fiction. However, any relation they may have to real situations is not purely coincidental, for while they are fictitious, they contain a number of processes that have been noticed while watching different kinds of real families. Both sketches are about a family involved with the problem of a daughter who has come home too late from a party the night before. In neither of these families is anyone too likeable or pleasant. But one of these families is considered to be like those we have studied which contain a schizophrenic. Both sketches are identical, except for what are considered to be essential differences. In both cases we are at a breakfast table; an average-looking middle-aged couple is beginning breakfast. A third place is set at the table.

1. *Nonschizophrenogenic Family*

(This sketch contains characters who know what they want, who are able to direct their behavior toward a common goal, who are not basically interested in doing each other a disservice, and who have a faith that whatever feelings they have toward each other can be expressed without too much hesitation. Thus, while they may be rude, unpleasant, impolite, and vulgar, they are somehow basically honest and have been able to agree to disagree. There are sounds of the ordinary tinkling of breakfast dishes, orange juice drinking, chewing. Mother and Father are seated alone, but a third place is set at the table. Detailed directional instructions have been omitted; the direction should straightforward.)

MOTHER: LEROY, YOU'RE GOING TO HAVE TO SPEAK TO MARGARET ABOUT COMING IN LATE LAST NIGHT.

FATHER: OH, NUTS! (Pause.) SAY, THERE ISN'T ANY SUGAR ON THE TABLE.

MOTHER: (Looks and finds.) THERE *IS* SUGAR ON THE TABLE. IT'S RIGHT BY YOU.

FATHER: WHY DO *I* HAVE TO SPEAK TO HER? *YOU* TALK TO HER—YOU'RE HER MOTHER.

(Mother looks at Father, expressing displeasure. She shakes her head wearily, as in wishing he would fulfill the obligation. She looks up to greet Daughter, Margaret, who enters quickly, sits down, and drinks her orange juice.)

DAUGHTER: 'MORNING.

FATHER & MOTHER: 'MORNING.

MOTHER: (After a pause.) MARGARET, YOU CAME HOME AWFULLY LATE LAST NIGHT.

DAUGHTER: WELL, THE PARTY WAS STILL ON AND I WANTED TO STAY.

MOTHER: YOU *KNOW* I THINK IT'S INDECENT FOR A GIRL YOUR AGE TO STAY OUT UNTIL TWO IN THE MORNING!

DAUGHTER: (Annoyed.) OH . . . !

MOTHER: I SUPPOSE YOU HAVE TO PROVE TO YOUR FRIENDS HOW GROWN UP YOU ARE.

DAUGHTER: OH, MOTHER! THEY'RE ALL *MY* AGE.

FATHER: (After a pause.) MARGARET, GET THE CREAM FROM THE REFRIGERATOR.

(Daughter rises to get the cream, brings it to the table for Father's coffee, then reseats herself.)

MOTHER: LEROY, MARGARET PROMISED YOU SHE WOULD COME HOME EARLIER, DIDN'T SHE?

DAUGHTER: I DIDN'T PROMISE ANYONE ANYTHING. I DID NOT STAY OUT TOO LATE AND I WAS ONE OF THE EARLIEST TO LEAVE THE PARTY. I DON'T LIKE YOUR PICKING AWAY AT ME. I DON'T THINK IT'S FAIR, AND ANYHOW, I DON'T HAVE TO LISTEN TO EITHER OF YOU ANYMORE. AT THE PARTY . . .

MOTHER: THAT'S ENOUGH, MARGARET.

(There is an ominous silence as the three continue with breakfast. Mother has stopped the conversation obviously because she feels a flare-up is on its way. She switches the topic.)

MOTHER: (Continuing.) MMMM, THE COFFEE *IS* TERRIBLE THIS MORNING.

FATHER: I DON'T THINK IT'S SO BAD. I MADE IT MYSELF.

MOTHER: THE COFFEE WAS BETTER YESTERDAY. MARGARET MADE IT THEN.

FATHER: MAYBE I MADE IT TOO STRONG.

DAUGHTER: (After a pause; tasting coffee.) IT DOES TASTE FUNNY, DADDY.

MOTHER: (Pause.) MARGARET, IF YOU WANT US TO LET YOU GO OUT AGAIN, JUST SEE TO IT THAT YOU COME HOME WHEN YOU'RE SUPPOSED TO.

DAUGHTER: WHY DO I *ALWAYS* HAVE TO COME HOME EARLY? ANYTHING THAT COULD HAPPEN TO ME AT TWO IN THE MORNING COULD HAPPEN TO ME JUST AS EASILY AT ELEVEN!

FATHER: DON'T SHOUT. LISTEN TO YOUR MOTHER.

MOTHER: I THINK THERE SHOULD BE A DEADLINE. A ONE O'CLOCK DEADLINE.

FATHER: IF THAT'S ALL RIGHT WITH YOUR MOTHER, IT'S ALL RIGHT WITH ME. ONE O'CLOCK AND NOT A SECOND LATER.

MOTHER: MY MOTHER WAS MORE STRICT WITH ME THAN WE'RE BEING WITH YOU. MOTHERS *SHOULD* BE STRICT.

FATHER: I THINK SO.

(Fadeout.)

NARRATOR: And now that same scene in a different sort of family.

2. *Schizophrenogenic Family*

(The setting is the same as in the first sketch. The pacing and movement are the same. There is a difference, however, in transitions, tonalities, and volume, and directions for these are included below. The emotional peak of these characters is lower than that of the characters in the first sketch. Also, these are characters who don't know what they want, who are unable to direct their behavior toward a common goal, who somehow seem to be undercutting each other, and who seem unable to respond with an open and honest emotional reaction. Most important, while they are basically dishonest and disagreeable, they are neither rude nor unpleasant nor impolite nor vulgar.)

MOTHER: (She has been looking at her food as she has been eating. She does not look at her husband until the sentence is in its last phrase. Her tone is one of bored familiarity with a situation in which she calls her husband to task for not fulfilling what she considers to be his function.) LEROY, I SUPPOSE YOU'RE NOT GOING TO DO ANYTHING ABOUT THIS EITHER?

FATHER: (He has heard this opening phrase before. He knows this time what his wife is talking about. But he too has a game. Whenever she begins this way, he expresses his annoyance by pretending to be oblivious to his wife's reference. He uses the word "dear" ineffectually to prevent his wife from noting that he might be annoyed with her. He looks at her for the first words of his speech, then his gaze drops.) WHAT'S THAT, DEAR?

MOTHER: (She looks in his eyes. She knows he knows. She doesn't like his pretending ignorance, which pretense has always given her a greater share of decision-making than she wants.) YOU KNOW VERY WELL.

FATHER: (He knows this isn't really it, as far as his wife is concerned, but he does really wonder if his wife's true objection isn't to the fact that Daughter had had a good time. Eyes on the food. With innocent detachment.) MARGARET'S GOING TO THE PARTY?

MOTHER: (In Father's eyes, with motherly conviction and sincerity.) I DON'T MIND HER GOING TO THAT PARTY, BUT SHE CAME IN SO TERRIBLY LATE.

FATHER: (Feeling his wife has been sincere, he concludes she is more susceptible to feeling hurt if cut off by him. So, he cuts her off by switching the topic. At the same time he makes a statement which he knows will get him into hot water. Thus, his guilt for expressing hostility towards his wife will be expiated when she comments negatively upon him because of his search for the sugar which is, in fact, right near him.) THERE ISN'T ANY SUGAR ON THE TABLE.

MOTHER: (She sees it immediately, but she considers how to break the news to him. With hardly a noticeable pause, she decides to sound sweet, indicating to him that she understands his attempt to change the topic, but is being quite magnanimous in not blasting him. She looks in his eyes.) THE SUGAR IS RIGHT BY YOU, DEAR.

FATHER: (He is: still avoiding his wife's gaze; slightly enjoying his wife's one-up position in which she has bared his stupidity; getting ready for his next maneuver, that of having found the sugar not as the result of, but rather simultaneously with, his wife's announcement; appropriately sugaring the coffee and looking at it. He knows that while his statement is nonsense, it may make sense superficially and throw his wife off the track. At the same time, he makes a little dig at his wife's raising of his child, as well as a dig at Daughter, herself.) WHY DO *I* HAVE TO SPEAK WITH HER? SHE'S A GIRL, ISN'T SHE?

MOTHER: (She temporarily leaves this topic to comment on a sore point of questionable validity. At the same time, she raises an extraneous complaint because she has forgotten any reason for why Father should speak to Daughter rather than she. Futhermore, Mother also now indicates that perhaps her entire interest in the issue of Daughter's latecoming is to irritate Father in the absense of other issues. Sweetly.) YOU SHOULD TALK TO HER, YOU ALWAYS TRY TO AVOID DOING WHAT I WANT.

FATHER: (He looks in her eyes in innocence and sincerity, believing himself to be innocent and sincere.) ALL RIGHT, I WILL.

(At this point, Daughter has already entered, has sat down, and while parents were in conversation, has begun to drink her orange juice.)

MOTHER: (Before Daughter has finished her juice and so, while she cannot answer; in a sweet voice that belies an intent to reprimand, and while looking in Daughter's eyes.) GOOD MORNING, MARGARET.

FATHER: (Summing up courage for his task, looking at his food after a quick glance to verify that Daughter was indeed there, and before she has finished her juice.) GOOD MORNING.

DAUGHTER: (After watching both parents while she was drinking, swallowing, and watching her glass as she puts it down, realizing that something is in the air.) GOOD MORNING.

FATHER: (He has just successfully talked it into himself that he is the figure in authority, and that it is indeed his responsibility to speak to his offspring about an infraction of this authority. There is even a slight swagger as he begins slowly, perhaps anticipating that his wife will break in, an event which, while slightly emasculating, will at least evoke the situation he originally wanted. He is lying about his initiation of the idea.) MARGARET, I'VE BEEN THINKING ABOUT YOUR COMING IN LAST NIGHT AND . . . IT OCCURS TO ME THAT IT WAS LATER . . . (interrupted.)

MOTHER: (As Father began, Mother looked at Daughter. When Father claimed originality for his concern over Daughter's lateness, Mother turned harshly to Father for stealing her authority; Mother had intended he be only an instrument for her. Mother returned her gaze to Daughter, noticed something [she thought] and, feeling she should demonstrate a mother's concern, spoke with sincerity toward Daughter, while smashing Father's speech.) YOU LOOK TIRED, DEAR.

DAUGHTER: (She looks at Mother, and actually is tired. But since she is aware that she is being tricked into some sort of punishing situation, she feels she had better begin fighting back early, although politely.) I'M NOT.

MOTHER: (Taken slightly but unnoticeably aback by Daughter's early morning forthrightness and ability to state clearly [although falsely] how she feels, Mother denigrates Daughter by implying, first, that she did not stay out due to her own volition; second, that she is not worthy enough of honestly being told directly by Mother that she came home late; and third, that she is unable to assess her own feelings or at least, cannot fool Mother.) I'M SURE IT WASN'T YOUR IDEA TO STAY OUT SO LATE. YOU *MUST* BE TIRED, DEAR.

DAUGHTER: (She realizes she must stand up and defend herself, and hopes that this time it might work and she could convince Mother that she is capable of functioning maturely. Still, she feels she had better downgrade the party for, somehow, Mother will be more pleasant to her if Mother believed she did not have such a good time.) WELL, THE PARTY WAS STILL ON. IT WASN'T VERY GOOD, BUT YOU CAN'T JUST GET UP AND LEAVE.

MOTHER: (She is suddenly upset by realizing Father has gotten his way and that even Daughter is arguing back. She is also upset by other unclear events. She changes pace and vents her rage on Daughter, somehow recognizing that with such a sudden pace change, the impact of criticism is much greater.) NO DECENT GIRL STAYS OUT UNTIL TWO IN THE MORNING.

(Father gives Mother, who is staring at Daughter, a derisive glance, because he knows she used to stay out to that late hour herself.)

(Mother averts her glance from Daughter to meet Father's eyes. Her expression of anger at Daughter is now anger at Father, since she knows what he is thinking.)

(Hurt and shocked by Mother's sudden change, Daughter watches her parents' exchange of glances without realizing exactly what they are about. Without being truly clear as to what is going on, she feels that she might best retreat now, to reorganize her forces later. Also, apology is in order, since possibly she did do something wrong. Anyhow, Mother seems to be pushing for an apology.)

DAUGHTER: (Not too enthusiastically or sadly because the tactic might have to be changed later.) OH, MOTHER, I'M SORRY.

(If Daughter apologizes, this takes the initiative away from Mother, which Mother does not want. While regaining initiative, Mother's self-instructions tell her: "While you're at it, take a slap at Father for his last gesture [without looking at him, so as to disguise intent], and try to prove to Daughter that you understand her motivation while she doesn't.")

MOTHER: (While speaking, Mother suddenly gets a little emotional and excited for no clear reason except the accumulation of other feelings.) I DON'T WANT APOLOGIES. AND YOU KNOW YOUR FATHER NEVER PUNISHES YOU. BUT YOU SHOULD BE GROWN UP ENOUGH TO KNOW BETTER. YOU JUST WANT TO PROVE TO YOUR FRIENDS HOW GROWN UP YOU ARE.

DAUGHTER: (Looking toward Father for support. She cannot look into Mother's eyes because Mother has been too stinging. Daughter appropriately feels that Father would side with her against Mother, since he has not been too sympathetic towards Mother.) I HAVE ONLY ONE FRIEND.

FATHER: (Upset by Mother's upset, and eager not to side with Daughter against Mother because this might be too effective, he blasts Daughter quietly.) DON'T CHANGE THE SUBJECT, MARGARET. NOW, YOU'RE A BIG GIRL NOW AND . . . (interrupted).

MOTHER: (Mother, still upset, doesn't feel comfortable with Father on her side against Daughter, so with emotion heretofore reserved only for Daughter, she blasts Father, unconcerned with her non sequiturs. In her last sentence she changes pace and decides that perhaps she needs Father to maintain discipline, which she does truly in part want. She meets Father's eyes.) MARGARET'S ONLY A CHILD. SOME DAY SHE'LL BE A MOTHER. YOU HAVE TO MAKE HER UNDERSTAND WE'RE THINKING FOR *HER* WELFARE.

FATHER: (Father, sweetly, looking in Mother's eyes, slapping her.) . . . "OF" HER WELFARE.

DAUGHTER: (Losing immediate contact with what is going on, Daughter's immediate association is absurd, but she says it anyhow to show her annoyance at her parents who, besides all the other annoyances, are now clearly using Daughter as a means to continue a battle that is primarily between themselves. Looking between them both.) DO WE NEED WELFARE?

FATHER: (Getting uncomfortable and deciding that he would rather have someone else uncomfortable, he shifts the context.) MARGARET, WOULD YOU MIND GETTING THE CREAM FROM THE REFRIGERATOR?

(Daughter starts to do Father's bidding, but she cannot understand how she lost the thread of continuity.)

MOTHER: (Not choosing to permit Father to change contexts, she sees the opportunity to use a mild recollection to snipe at both Father and Daughter. Preventing Daughter from getting the cream by a sweep of her arms, she addresses Father.) LEROY, SHE PROMISED YOU SHE'D COME HOME EARLIER, DIDN'T SHE?

DAUGHTER: (Not giving up yet, she spots this as a clear misstatement. With the strength of clarity and conviction, she puts real feeling into her remonstration.) I DIDN'T SAY I WOULD.

MOTHER: (Quickly retreating so as not to admit Daughter's good point, she keeps her gaze on Father from the last speech and, in effect, denies that Daughter has even spoken. Calmly and assuredly, Mother tastes the coffee and returns her glance to Father and "slaps" him as well. Then she continues drinking.) LEROY, THE COFFEE IS TERRIBLE THIS MORNING.

FATHER: (Having lost continuity, but feeling the show must go on, he weakly attempts to be half-humorous. While drinking.) GREMLINS MUST HAVE GOTTEN INTO THE COFFEE.

(Daughter, confused, sits down and sips, wondering where she got lost.)

MOTHER: (Forming a brief alliance with Daughter to better snipe at Father. On the second sentence she looks up from her cup.) YESTERDAY IT WAS MUCH BETTER. YOU MADE THE COFFEE YESTERDAY, DIDN'T YOU, MARGARET?

DAUGHTER: (She talks to herself; it's impossible to talk to them.) IT DOES TASTE FUNNY.

FATHER: (Appropriately forgetting the squabble.) THE COFFEE *WAS* BETTER YESTERDAY, MARGARET. YOU SHOULD MAKE IT EVERY DAY.

MOTHER: (Restless at the quietude, she picks up another sore point: Father gets out of their bed quite early in the morning, as if he couldn't wait to arise.) YES, LEROY, I KNOW YOU HAD TO GET UP AND MAKE IT. I NEVER KNEW ANYBODY SO RESTLESS.

FATHER: (To get off the hook, he forms a mock alliance with Daughter rather hurriedly and artificially. He starts out his immediate alliance by looking at Daughter, then shifts his focus to Mother whom he is really addressing.) A GIRL OF 18 *IS* A RESPONSIBLE GIRL.

MOTHER: (Defending her point quietly.) RESPONSIBLE TO GET HOME WHEN SHE IS SUPPOSED TO, LEROY.

DAUGHTER: (Weakening, she addresses the area between them, but they continue looking at each other.) OK, I'M SORRY.

MOTHER: (Sweetly towards Daughter, she reassures Daughter who has not yet realized how little she has to do with the issue of her lateness.) WE'RE NOT BLAMING YOU.

FATHER: (Appropriately and, in fact, correctly.) IT'S NOT A QUESTION OF BLAME.

MOTHER: (Appropriately.) IF YOU WANT US TO LET YOU GO OUT, JUST SEE TO IT THAT NEXT TIME YOU COME HOME WHEN YOU SAY YOU WILL.

DAUGHTER: (Trying to protest her innocence strongly at first, she then produces a weak but truthful comment, then trails off as if no one were listening anyhow.) BUT I DIDN'T SAY . . . ANYTHING THAT COULD HAPPEN TO ME AT TWO IN THE MORNING COULD HAPPEN TO ME JUST AS WELL AT ELEVEN.

FATHER: (Using an opportunity to assert himself while hiding under Mother's wing and slapping Daughter for her sensible answer.) DON'T MUMBLE. LISTEN TO YOUR MOTHER.

MOTHER: (Uneasy at her alliance with Father, and distorting Daughter's statement.) LEROY, PLEASE. AFTER ALL SHE DID SAY IT WAS SUCH A NICE PARTY.

DAUGHTER: (Helpfully, a last ditch stand.) MY FRIEND JANET HAS A DEADLINE.

MOTHER: (As if helpful, truthful.) SHE'S A NICE GIRL, BUT HER MOTHER SHOULD KEEP AN EYE ON HER.

DAUGHTER: (Seeking clarification, plaintively.) WHEN *SHOULD* I COME BACK?

MOTHER: (Helpfully.) YOU'RE OLD ENOUGH TO USE YOUR OWN JUDGMENT. . . . WHEN DO YOU THINK IT SHOULD BE?

(At this point, Daughter has no idea what is expected of her to say. Every attempt to reach an understanding has been defeated. Fortunately she can drift off into her own world. She almost unnoticeably stares off into the void between the parents.)

FATHER: (Having continued eating and noticing Mother looking at Daughter as if Mother were waiting for an answer, he gets annoyed and worried, and suggests a symptom to Daughter, inadvertently.) MARGARET, ARE YOU HAVING ONE OF YOUR SILENT SPELLS AGAIN?

MOTHER: (Noting Father's concern, she supports him in his attempt to reach Daughter, but it is too late.) MARGARET, YOUR FATHER HAS SPOKEN TO YOU.

FATHER: (He tries to minimize the issue by returning to his food. He looks up once or twice to see Daughter is unchanged in her position. He tries to be nonchalant and looks at his cereal, as he asks:) MARGARET, WOULD YOU *PLEASE* GET THE CREAM?

(Mother remains looking at Daughter.)

(Daughter remains staring into space.)

(Father, after a pause in which he is aware that Daughter will not arise for the cream, looks up sadly at her and shakes his head. He meets Mother's eyes.)

(Mother meets Father's eyes.)

(Fadeout.)

NARRATOR: The second scene was the one with the sort of family considered to be schizophrenogenic. A number of researchers are presently testing the theory that in these families there are more schizophrenogenic elements than in "normal" families where no member is or becomes schizophrenic. The work on this has only begun.

C. Summary

This script attempted to dramatize the "double-bind" theory of the etiology of schizophrenia. Two family scenes were portrayed, one schizophrenogenic, the other not. Both sketches were involved with the problem of parents with a daughter who had come home too late from a party the night before. In neither family was anyone too likeable or pleasant. The only inappropriate element in the schizophrenogenic sketch, compared with the nonschizophrenogenic, was the incongruity of dialogue, gesture, and mood in the light of the context upon which the parents should have been focusing. Although the script was dramaturgically primitive, its enactment and evaluation may permit direct apprehension of the theoretical phenomenology of such morbid interaction and provide a concrete point of departure for discussions of the schizophrenogenic family interaction hypotheses of other theorists.

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THE EFFECTS OF DELAY INTERVAL ON WORD RECALL AND CLUSTERING*

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A. INTRODUCTION

Forgetting and clustering of verbal items during free recall has been clearly demonstrated in recent years; however emphasis has been placed upon these effects during immediate rather than long-term recall. Gonzales and Cofer (7) found a loss during recall of 15-18% of the list items following a five-minute delay period, using an interpolated activity paradigm. While investigating longer delay intervals, up to three weeks at one-week increments, Brand and Woods (3) found that after one week no significant losses in word recall and clustering occurred.

In a series of experiments, Mandler (8) provided recall data from .5 week to 15 weeks. These data showed that forgetting increased rapidly up to about four weeks and then leveled off with no significant losses occurring even after four months. Category recall and the number of clusters used were also found to decrease over the reported time period. The results are somewhat inconclusive, however, inasmuch as the forgetting function reported is made up of recall percentages from different types of lists which varied in length and item frequency. In addition, the data reported included only about 55% of those *S*s tested.

While there is still a question as to the point at which losses during recall levels off, no systematic examination of retention intervals of less than one week has taken place. The purpose of the present experiment was to examine the effects of different delay intervals, up to one week, upon the number of words recalled, degree of clustering, number of clusters, and cluster size. Performance on each of these measures was expected to vary inversely with increases in the delay interval.

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B. Method

1. *Subjects*

Two hundred forty-nine (249) senior psychology students from three high schools in Harford County, Maryland, served as *S*s. Due to absenteeism, failure to comply with instructions, and expressed knowledge of the retention test, 49 *S*s did not complete the task. There were 10 *S*s in each of 20 experimental conditions.

2. *Lists*

Stimulus words were each typed on 3 × 5 cards. A series of 48 words made up a deck and decks were of two types. One type (categorized) was comprised of six words from each of eight superordinate categories: units of time, metals, alcoholic beverages, sports, weather phenomena, musical instruments, types of vehicles, types of birds. The second type (random) was comprised of 48 unrelated words none of which was chosen from the same conceptual category.

Half of the words in each of the eight categories of the categorized list and half of the random-list words were frequent; the other half were infrequent. Battig and Montague (1) was the source of the frequency norms and category members. To arrive at these norms 442 *S*s responded by providing items that were considered to be members of a general or superordinate category. High frequency words for the random and categorized lists ranged from 160 to 438, while the low frequency words ranged from 1 to 6.

Each *S* received two decks containing the same words. The decks plus a response booklet were enclosed in a manila envelope. Instructions particular to an *S* were placed on the cover of the envelope.

3. *Procedure*

The *S*s were tested in groups; the number per group varied depending upon the size of the particular class. The learning trials took place in the classrooms in which the *S*s took psychology. All classes were heterogeneous with regard to student ability.

All *S*s were instructed to learn the words on the cards, and they were to do this by placing the cards—one at a time—into piles corresponding to words they felt went together. Restrictions were placed upon the sorting procedure in the following manner. Half of the *S*s (constrained-sort group) could only use *four* piles, while the other half (free-sort group) could use from *two* to *eight* piles depending upon their own preference. Half of each of these *S*s in turn received the categorized list, the other half the random list. Each class was divided equally into the four groups, with precautions taken that no two

*S*s having the same list and sorting instructions would be seated next to eac other.

Three recall tests, two immediate and one delayed, were used. The experimental paradigm consisted of *sort-test, sort-test, delay* and *test.* The *S*s were given a maximum of five minutes for each card sort. Following each sort they numbered the piles and put the numbered piles together into a stack. Cover cards identifying the decks were put in place and the written recall test immediately began. Total time from end of sort to beginning of recall was less than 30 seconds.

The retention intervals employed were 1 hour, 2 hours, 5 hours, 24 hours, and 168 hours (1 week). Each class contributed to only one of these intervals. The one-week retention group was made up of students from one high school; the 1-hour, 2-hour, and 5-hour, 24-hour groups were contributed to equally by the other two high schools.

All *S*s received standard instructions regarding sorting and testing. The *S*s included in the 1-hour, 2-hour, and 5-hour groups were told, in addition, that they would be participating in an additional experiment. The second experiment would be short, but due to time limitations they would have to report later that same day to the cafeteria or auditorium (depending upon the school). When the *S*s arrived for the second experiment they were told to write the words they had learned. The 24-hour and 1-week groups were not given such instructions and had no idea they would be seeing *E* again. No *S* reported being constrained by the time factor. Total time for instructions and learning trials was 30 minutes.

C. RESULTS

A series of measures will be described separately. These measures are as follows: amount recalled, normative frequency effects, degree of clustering, cluster size, and number of clusters. The data of each of these measures were subjected to an analysis of variance (4) with list type, sorting technique, and delay interval as between-*S*s variables and recall tests as a within-*S* variable. Word frequency was an additional within-*S* variable for the amount recalled analysis. Analyses of variance were done on the second recall test (T_2) and the delayed recall test (T_3) to investigate the retention effects.

1. *Amount Recalled*

Table 1 shows the mean number of words recalled for all conditions under investigation. It is apparent that learning the categorized list enhances recall. Analysis of the data substantiated the significance of the higher recall for the

TABLE 1
RECALL SCORES FOR T_2 AND T_3 ACCORDING TO MEASURE EMPLOYED

Variable	Amt. recalled		Freq.		Infreq.		DC		Cluster size		Clusters	
	T_2	T_3	T_2	T_3	T_2	T_3	T_2	T_3	T_2	T_3	T_2	T_3
List type												
Random	30.38	25.97	17.41	15.20	12.97	10.77	.75	.69	3.60	3.15	6.77	5.83
Categorized	37.90	34.08	21.34	19.53	16.66	14.55	.91	.89	5.00	4.43	7.44	7.14
Sort. Tech.												
Free	35.81	31.86	20.09	18.18	15.72	13.68	.83	.77	3.89	3.55	7.89	7.00
Constrained	32.47	28.19	18.66	16.55	13.81	11.64	.83	.81	4.71	4.03	6.32	5.97
Delay Int.												
1 hour	35.13	33.30	19.63	18.75	15.50	14.55	.84	.82	4.50	4.11	7.33	7.23
2 hour	32.53	31.55	18.60	17.55	13.93	14.00	.78	.74	3.89	3.38	6.73	6.75
5 hour	34.88	33.00	19.98	18.78	14.90	14.20	.85	.85	4.38	4.07	7.40	7.08
24 hour	34.30	31.12	19.70	18.28	14.60	12.85	.85	.80	4.34	4.01	7.10	6.45
1 week	33.87	21.18	18.98	13.48	14.90	7.70	.83	.76	4.42	3.37	6.98	4.93

categorized-list group, $F(1,180) = 91.07$, $p < .001$. The free-sort group recalled more words than the constrained-sort group. Analysis of the main effect of sorting technique substantiated the superiority of the free-sort group, $F(1,180) = 18.32$, $p < .001$.

From Table 1 it is apparent that the number of words recalled decreased from T_2 to T_3 and the decrement is seen to increase as the interval increases. The Delay Interval effect was found to be significant, indicating that performance varied inversely with the interval, $F(1,180) = 8.68$, $p < .01$. The data underlying the significant Tests × Delay Interval interaction, $F(4,180) = 53.11$, $p < .001$ are shown in Figure 1. It can be seen that the slopes of the lines increase directly with increases in the delay interval reflecting forgetting.

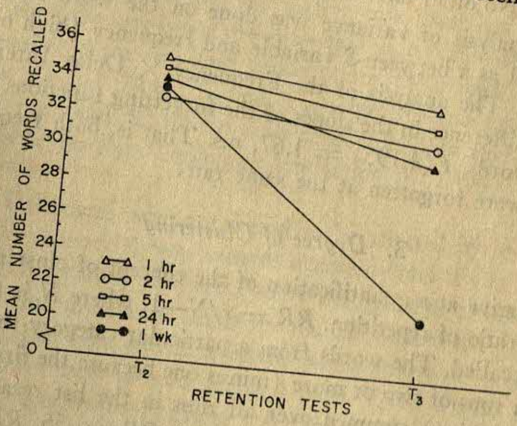

FIGURE 1

MEAN NUMBER OF WORDS RECALLED ON T_2 AND T_3 AS A FUNCTION OF DELAY INTERVAL

When the delayed recall data (T_3) were transformed into percentages of T_2 recall in order to take into account differential individual performance on T_2, the analysis showed a significant forgetting effect, $F(1,180) = 51.87$, $p < .001$. The means over the respective delay intervals were 95%, 92.6%, 92.2%, 89.5%, and 61.6%. The categorized-list group recalled a higher percentage of the words recalled on T_2 than the random-list group (89% *vs.* 83%). This effect proved to be statistically significant, $F(1,180) = 12.6$, $p < .001$. No other effects reached the .05 level of significance.

In summary, the categorized-list and free-sort groups recalled more words than the random-list and constrained-sort groups. Forgetting increased directly as a function of delay interval, with the categorized-list group recalling a higher percentage of the words learned on T_2 than the random-list group.

2. *Word Frequency*

Both list types were comprised of equal numbers of high and low normative frequency words, making it possible to examine differences in the contribution of each to the overall mean recall. Table 1 shows the mean frequent and infrequent word recall data for T_2 and T_3 by variable. Analysis of the data substantiated the general superiority of the frequent word recall, $F(1,180) = 400.38$, $p < .001$. No other effects approached the .05 level of significance.

A subsequent analysis of variance was done on the word frequency data, with delay interval as a between-*S* variable and frequency (high or low) as a within-*S* variable. The analysis of the Frequency × Delay Interval interaction revealed no difference in the slopes of the forgetting functions for frequent and infrequent words, $F(4,195) = 1.67$, n.s. That is, both frequent and infrequent words were forgotten at the same rate.

3. *Degree of Clustering*

In order to arrive at a quantification of the concept of clustering, Bousfield (2) set up the ratio of repetition, $RR = r/N—1$, where N is the total number of words recalled. The words from a particular category that are recalled continuously in runs of two or more (minus one because the first item recalled cannot be a repetition) summed over all runs in the list recalled becomes r. For example, in the series xxxxyxzyyyxyyzzz, $RR = .56$. $RR = 1.00$ only when one run is recalled. The present experiment will use as the measure to reflect the degree of clustering, $DC = c/N$, where c is the total number of words included in strings of two or more words from the categories defined by *S*. N is equal to the total number of words recalled. For example, in the series xxxxyxzyyyxyyzzz, $DC = .75$. The traditional clustering measure ($RR = r/$N-1) has been modified in order to take into account the transition from one category to another, a weakness pointed out by Shuell (10). The measure used here reflects perfect clustering (1.00) when any number of categories are represented and all words recalled are in clusters. In this and subsequent assessments of categorization, *the categories are those defined by* S *in the sorting task.*

The mean DC scores for the three experimental variables are shown in Table 1. From the table it is seen that clustering fell off from T_2 to T_3, with respective mean DC scores of .83 and .79. Analysis of the cluster scores revealed a significant Tests effect, $F(1,180) = 17.45$, $p < .001$. This decrease in clustering reflected the effects of retention. In addition, the main effect of list type was found to be significant, $F(1,180) = 102.1$, $p < .001$, indicating that the categorized-list group clustered more words than the random-list group.

The two-hour group was found to have highly disparate means and *SD* (.209 *vs.* .141, .142, .139, .151 for T_2 and .213 *vs.* .157, .131, .180, and .216 for T_3). The difference was seen to be an artifact which caused a significant delay interval effect. When these data were left out of the analysis, delay interval effects were no longer present. Although *DC* decreased from T_2 to T_3, the decrease cannot be attributed to the increasing delay interval. A possible explanation for the decrease is that the sorting task itself has a positive effect upon *DC* and when the sort is not present—that is, on T_3—*DC* decreases.

With the removal of the two-hour group's data, the mean *DC* for the free-sort group were .85 and .79 on T_2 and T_3; while the constrained-sort group had *DC* scores of .83 and .82 for the same tests. The data analysis indicated a significant Tests × Sorting Technique interaction, $F(1,144) = 4.11$, $p < .05$.

In summary, *DC* scores were not found to be affected by increasing delay intervals; however, clustering was seen to decrease from T_2 to T_3. This decrease was seen to be possibly attributed to by the omission of the sorting task. *DC* scores were found to be more stable for the categorized-list group than the random-list group. List type proved to be the most important variable affecting clustering. *DC* scores were seen to decrease from T_2 to T_3 for the free-sort group, while the constrained-sort group remained stable.

4. *Cluster Size*

The mean cluster size is the ratio of the number of clustered words to the number of clusters used. The number of clusters could vary between two and 24. Table 1 shows the mean cluster size for the three primary variables on T_2 and T_3.

It is apparent that the categorized-list group recalled larger clusters than the random-list group. Analysis of the data confirmed the significance of the differences in cluster size by list type, $F(1,180) = 50.61$, $p < .001$. The constrained-sort group recall contained larger clusters than the free-sort group, $F(1,180) = 12.03$, $p < .01$. An analysis of the cluster size data also revealed a significant interaction of Tests × Sorting Technique, $F(1,180) = 3.98$, $p < .05$. The average cluster sizes for the constrained-sort groups were 4.71 and 4.03, whereas the free-sort group had means of 3.89 and 3.55 for the two tests.

In short then, the use of more but smaller categories on the part of the free-sort group resulted in more efficient organization and less of a decrement, from T_2 to T_3, .34 *vs.* .68 words per cluster, than the constrained-sort group. Delay interval was found to have no effect on cluster size up to one week; however, at the one-week interval the size of the clusters used were significantly smaller than those on T_2, $t(39) = 2.77$, $p < .01$.

5. *Number of Clusters*

The range for the number of clusters used in the experiment was 1 to 12 with means of 7.09 and 6.49, for T_2 and T_3 respectively. Analysis of these data revealed this to be a significant main effect for tests, $F(1,180) = 19.03$, $p < .001$.

Table 1 shows the mean number of clusters on T_2 and T_3 for the three variables being investigated. The data underlying the significant main effect for list type indicated that the categorized-list group recall contained more clusters than the random-list group, $F(1,180) = 20.83$, $p < .001$. Similarly, the data underlying the main effect for sorting technique indicated that the free-sort group recall contained more clusters than the constrained-sort group, $F(1,180) = 36.17$, $p < .001$.

The mean numbers of clusters used on T_2 and T_3 were 6.77 and 5.83 for the random-list group, whereas the categorized-list group had means of 7.4 and 7.14. These data provided for a significant interaction of Tests × List Type, $F(1,180) = 5.83$, $p < .05$. This loss of nearly one cluster on T_3 by the random-list group seems to provide additional evidence for the lack of stability in clustering due to the unstructured nature of the list.

The data underlying the effect of delay interval, $F(4,180) = 4.85$, $p < .01$, and the interaction of Tests × Delay Interval, $F(4,180) = 7.5$, $p < .001$, are shown in Figure 2. A comparison of T_2 and T_3 can be made by comparing the open and closed triangles. The number of clusters is seen to vary inversely with the delay from T_2 to T_3. The curve closely resembles the forgetting effects seen in Figure 1; as clusters are lost, words are forgotten.

In summary, the number of clusters was highest for the categorized-list group and free-sort group. Clusters decreased as the delay interval increased.

D. DISCUSSION

The major finding of the experiment was the differential effects of the delay interval upon the measures of organization examined. The number of words recalled and the number of clusters used during recall were found to decrease as the delay interval increased, while there was no differential effect delay interval upon the degree of clustering, cluster size, and word frequency.

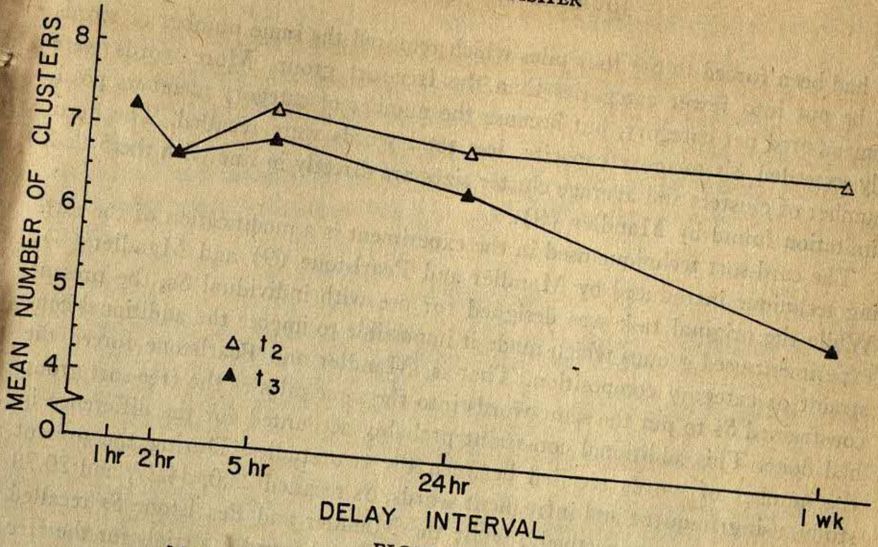

FIGURE 2
MEAN NUMBER OF CLUSTERS RECALLED AS A FUNCTION OF DELAY INTERVAL ON T_2 AND T_3

The results are in partial agreement with the equivocal results of previous investigations. Brand and Woods (3) and Mandler (8) reported a decrease in clustering (RR) and a decrease in word recall, while Cofer (5) reported an increase in clustering and a decrease in recall. In addition, forgetting appeared to be related to the loss of clusters rather than words within the clusters. This interpretation is in agreement with Cohen's (6) "some-or-none" characteristics of coding with the modification of clusters rather than categories.

Rather unexpectedly, frequent and infrequent words were found to be forgotten at the same rate. The lack of differential forgetting of frequent and infrequent words adds additional support to Cohen's "some-or-none" hypothesis and provides some degree of insight into the nature of a cluster. If the clusters were made up of a consistent ratio—i.e., 2:1—of frequent to infrequent words, the loss of clusters over the delay interval would reflect the lack of differences in the slope of the forgetting curve.

The data relating to the size and number of clusters used during recall appear to be directly relevant to the topic of a limited memory capacity. It was shown that the constrained-sort group used larger clusters than the free-sort group, but fewer clusters and fewer words were recalled. A possible explanation for this is that during the first and second card sorts the constrained-sort

*S*s had been forced to use four piles which required the same number of words to be put into fewer categories than the free-sort group. More words were remembered per category, but because the number of category members possibly exceeded *S*'s memory capacity, less total words were recalled. The mean number of clusters and average cluster sizes are directly in line with the 5 ± 2 limitation found by Mandler (8).

The card-sort technique used in the experiment is a modification of the sorting technique introduced by Mandler and Pearlstone (9) and Mandler (8). While the original task was designed for use with individual *S*s, the present experiment used groups which made it impossible to impose the additional constraint of category composition. That is, Mandler and Pearlstone forced the constrained *S*s to put the same words into the same piles as the free-sort group had done. This additional constraint probably accounted for the difference in the number of words recalled between the two studies. During the present study, using frequent and infrequent words, *S*s recalled 23.0, 34.27, and 29.78 for the three tests respectively, while the Mandler and Pearlstone *S*s recalled only 19.65 out of 52 high frequency words after 3.5 and 7.5 trials for the free and constrained groups respectively.

In a subsequent series of studies Mandler (8) found a linear relationship between number of categories and amount recalled. The present experiment failed to confirm this finding. The free-sort categorized group almost entirely used eight categories during the sort; the only data source for the categories (piles) and amount recalled relationship, therefore, was the free-sort, random-list group. Thirty out of the 50 *S*s in this group used other than eight piles; the resulting correlations of categories and amount recalled were $r_{t1} = -.09$, $r_{t2} = .05$, and $r_{t3} = .015$; none of these correlations reached significance. A relationship did exist, however, between the number of clusters used and amount recalled. The free-sort, random-list group was also used for this comparison. The resultant correlations were $r_{t1} = .78$, $r_{t2} = .56$, and $r_{t3} = .79$; all of these correlations exceeded the .001 level of significance.

Although learning the categorized list led to greater recall, the experiment substantiated previous findings concerning the occurrence of clusters during the recall of apparently unrelated words and the relationship in general of the effects of organization and recall (11).

E. Summary

The purpose of the experiment was to test the hypothesis that amount recalled and clustering are inversely related to the delayed recall interval. With the use of intervals of 1 hour, 2 hours, 5 hours, 24 hours, and one week, the

results indicated that the amount recalled and number of clusters recalled decreased with increases in the delay interval. However, word frequency, degree of clustering, and cluster size were not affected.

List type was found to be the most important determiner of performance. The categorized-list group recalled more words, had the greatest degree of clustering, and formed larger clusters than the random-list group. The experiment substantiated previous findings on the relationship of organization and recall.

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DIMENSIONS OF COLOR VISION REVISITED*[1]

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A. Introduction

Over a decade and a half ago, Ekman (2) introduced his then new method of similarity analysis, a multidimensional scaling scheme. After a great deal of subsequent research, he further developed and modified his earlier thinking into a content-vector model (cf. 3, 5).

In his 1954 effort, Ekman had 31 judges respond to a pair-comparison presentation of 14 color stimuli; color filters were used which transmitted light having wavelengths ranging from 434 mμ to 674 mμ.[2] The judges rated degree of "qualitative similarity" of the lights on a five-point category scale ranging from 0 ("no similarity at all") to 4 ("identity"). The similarity rating scores were averaged across judges and were then linearly transformed to a scale which ranged from zero to unity. A similarity matrix (14 × 14) was constructed and was factor analyzed with the use of the group centroid method. Five factors were extracted and were rotated orthogonally to a criterion of simple structure. The five factors were interpreted as hue factors and were labeled violet, blue, green, yellow, and red. In a very ingenious fashion, Ekman plotted the factors' loadings against light spectrum wavelength (on the abscissa). The result of this was a most impressive display which Ekman argued "looked like" the physiologically-based findings reported by Granit (6).

It is interesting to note that Coombs (1) reanalyzed Ekman's data, on a somewhat restricted basis (only with eight of the 14 stimuli), using a nonmetric multidimensional model developed by Hays and Bennett (9). He obtained a two-dimensional solution: blue *vs.* red and violet *vs.* yellow. Such a

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* Received in the Editorial Office, Provincetown, Massachusetts, on November 10, 1970, and published immediately at 35 New Street, Worcester, Massachusetts. Copyright by The Journal Press.

[1] This is a research report from the Laboratory of Clinical-Social Psychophysics and Scaling. The investigation was supported, in part, by a grant from the University Committee on Research, The University of North Dakota. The second author is now with the American Institutes for Research, Palo Alto, California.

[2] Even though the presently suggested measurement unit for wavelength is the nanometer (nm) and not the millimicron (mμ), we have continued to use the millimicron unit, as the present investigation reports a reanalysis of data which were originally described in terms of this older measurement unit.

two-dimensional solution is most difficult to reconcile with any particular theory of color vision.

Just recently the present investigators have described an important modification to Ekman's content-vector multidimensional scaling scheme (13, 14, 15).[3] The modification, although far-reaching in consequence, is quite simple. Judgmental data (similarity estimates) are secured in the same manner as stipulated by Ekman (cf. 4). We propose that resulting similarity matrices should best be considered only as averaged raw data (across k judges) and that product-moment correlations between stimuli be computed. For the purpose of calculating these "correlational similarities," a $m \times m$ (where $m =$ number of stimuli) mean similarity matrix with unities in the main diagonal is treated as a set of m column vectors, each vector being composed of m elements. Column vectors are then intercorrelated. If there are m column vectors to be intercorrelated, $[m(m - 1)]/2$ correlations will result. These correlations, when arranged in matrix form, become a correlational similarity matrix.

Such a correlational measure of similarity incorporates *all* of the judgmental information possessed and may range from —1.00 to 1.00.[4] With correlational similarity an r of 1.00 indicates perceived identity, 0.00 indicates no systematic similarity (dissimilarity), and —1.00 can be interpreted as descriptive of perceived opposites (i.e., maximum systematic dissimilarity).

The correlational similarity matrix is then factor analyzed and the resulting factors are rotated (if necessary) so that they can be more clearly viewed and understood. The extracted factors may be interpreted as similarity judgment-dimensions. It should be noted that such factor-dimensions can differ from those obtained with the use of Ekman's model with respect to one very major characteristic. Ekman's similarity matrix representation is composed of averaged similarity estimations which, by necessity, are all positive. As a consequence, all stimuli load positively (especially after rotation) on the extracted judgmental factors. On the other hand, since correlational similarities may also be negative, a factor analysis of a correlational similarity matrix *may* reveal bipolar judgment factors.[5] This fact will, in the latter portion of this report, be shown to be of considerable importance in addition to having explanatory value.

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[3] Until the supply is exhausted, the monograph by Stone, Coles, and Lindem (15) is available without cost from its first author.

[4] The quality of measurement of anything is greatly dependent upon the reliability of the measurement. We have devised a scheme whereby the reliability of any set of correlational similarities can be estimated. The accomplishment of such an estimation is rather simple and straightforward. A correlational similarity matrix is computed on the basis only of the similarity estimations pertaining to *even*-numbered stimulus comparisons (even-numbered elements in each of the m column vectors of the mean similarity matrix). Another correlational similarity matrix is computed on the basis only of the stimulus estimations pertaining to *odd*-numbered stimulus comparisons (odd-numbered elements in each column vector). The correlation between these two correlational similarity matrices is computed and provides a "split-half" reliability estimation. Reliability estimations based on the split-half paradigm are generally "corrected" with the use of Spearman-Brown logic (cf. 8, pp. 492-494). The reliability estimates for the two data sets used in the present paper are quite high and statistically significant. The estimated reliability (corrected) for correlational similarity computed from the Ekman (2) investigation was quite high ($r = .98$, df 89, $p < .0001$). Likewise, estimated reliability (corrected) for correlational similarity computed from the judgmental data from the Ekman (4) investigation was also high ($r = .89$, df 19, $p < .0001$).

The purpose of the present investigation was to apply the new Stone-Coles multidimensional scaling method to the color evaluation judgment-response matrices presented by Ekman (2, 4).

B. Method and Results

Correlational similarities were computed (see Table 1) from Ekman's (2) similarity matrix (his Table 1). The resulting correlational similarity matrix was factor analyzed (principal components) and the resulting three factors were orthogonally rotated to a varimax criterion (11). The rotated factor matrix is shown in Table 2. The amount of variance accounted for, by the three extracted factors, is considerable: 88 percent. The communalities (h^2) were also uniformly large. On an average, these communalities were .15+ larger than those reported by Ekman (2) with respect to his obtained five factors.

TABLE 1
Correlational Similarity Matrix*

Stimulus	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. 434mμ	100	98	59	54	07	—29	—37	—41	—56	—49	—39	—31	—27	—21
2. 445		100	65	60	14	—24	—34	—38	—59	—54	—45	—37	—32	—27
3. 465			100	97	59	05	—19	—25	—62	—67	—63	—60	—54	—52
4. 472				100	67	15	—14	—21	—62	—69	—67	—63	—58	—55
5. 490					100	72	35	23	—48	—67	—72	—71	—69	—69
6. 504						100	80	65	—19	—45	—60	—62	—69	—63
7. 537							100	92	04	—27	—49	—54	—56	—57
8. 555								100	20	—16	—43	—49	—52	—52
9. 584									100	74	46	28	19	18
10. 600										100	87	68	57	47
11. 610											100	92	85	78
12. 628												100	98	91
13. 651													100	95
14. 674														100

* Decimals omitted.

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[5] We have found that bipolar representation is only shown when such a representation is justified by the judgmental data. The model does *not* force the percepts to be cast into unjustifiable (meaningless) bipolar form. A report of instances when bipolarity of judgment factors was not found is now being prepared.

TABLE 2
ORTHOGONAL FACTOR MATRIX

Wave-length	I	II	III	h^2
434mμ	.00	.26	—.91	.89
445	—.04	.32	—.90	.91
465	—.19	.69	—.58	.85
472	—.23	.74	—.51	.85
490	—.50	.77	.10	.86
504	—.70	.40	.50	.90
537	—.80	—.01	.48	.88
555	—.80	—.18	.44	.87
584	—.06	—.84	.26	.77
600	.40	—.77	.25	.81
610	.75	—.54	.26	.92
628	.87	—.37	.27	.97
651	.90	—.27	.25	.95
674	.89	—.25	.21	.89
Amount of variance accounted for	37%	27%	24%	88%

Factors I and II are interpretable: green and red stimuli have high bipolar loadings on Factor I, and blue and yellow stimuli have high bipolar loadings on Factor II. Factor III (as given in Table 2) was not so readily interpretable. This factor III bore some resemblance to Ekman's (2) violet factor, and he suggested that his factor possibly might be best characterized as having some relationship to the other hue factors. However, he did not implement this suggestion; he held to orthogonal rotations.

With three factors there are three plots. The plot of the orthogonally rotated factors I and II satisfied a simple structure criterion most adequately. However, the plots of III with I and III with II indicated that simple structure might better be achieved if the reference axes were allowed to be obliquely rotated (see Figure 1). We decided to rotate factor III 45°, in a counterclockwise direction, from its orthogonal position with respect to factor I (the most sizable factor). In other words, the *r* between factors I and III (after the 45° rotation) was .5. This rotation is shown in Figure 1. Following this oblique rotation of factor III, the loadings on all three factors were graphed against the light spectrum wavelength scale. Perusal of Figure 2 shows these factors in relation to mμ.

The same reanalytic procedure was used with the similarity estimation data reported (as his Experiment III) by Ekman (4). In this later investigation 15 judges made similarity estimations, on a scale from zero ("no similarity") to 100 ("identity"), regarding seven colored light stimuli (range: 522 to 580

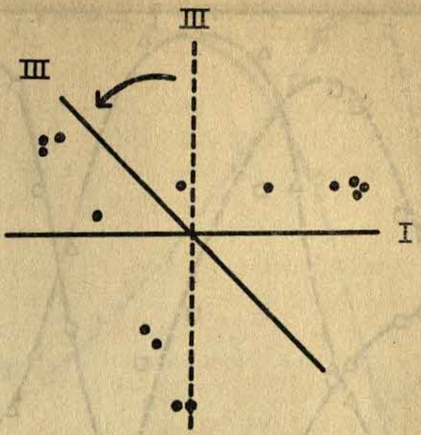

FIGURE 1
A GRAPHIC REPRESENTATION OF THE OBLIQUE FACTOR ROTATION PERFORMED

mμ). Ekman factor analyzed (prinicpal factors) the averaged similarity matrix and extracted two factors, a "green" factor and a "yellow" factor.

From Ekman's (4) similarity matrix (his Table 1) we computed a correlational similarity matrix (7 × 7). This matrix was factored (principal components) and the two extracted factors were rotated by a varimax routine. This factor solution is presented in Table 3. Factor I clearly may be characterized as a bipolar green-yellow dimension and the second factor resembles factor III obtained in the reanalysis of the Ekman (2) data. In Ekman's (4) analysis two factors also emerged, but nothing of his seemed to correspond to our second factor. Our two factors were graphed against mμ (Figure 3). Even when considering the narrow range of the stimuli, the factorial results bear close correspondence to the reanalyzed factorial results of the Ekman (2) similarity judgments. The amount of variance accounted for by the two factors (98%) is unusually high as are the communalities (the lowest is .98). It is quite obvious that the 7 × 7 correlational similarity matrix can be most accurately reproduced from the loadings on these two factors.

C. DISCUSSION

The graphic representation of the factor analytic results (Figure 2) corresponds in a somewhat surprising manner to the fundamental curves specified by the Hering-Hurvich-Jameson opponent-process theory of color vision (10). Factors I and II quite closely resemble the dual theorized chrominance con-

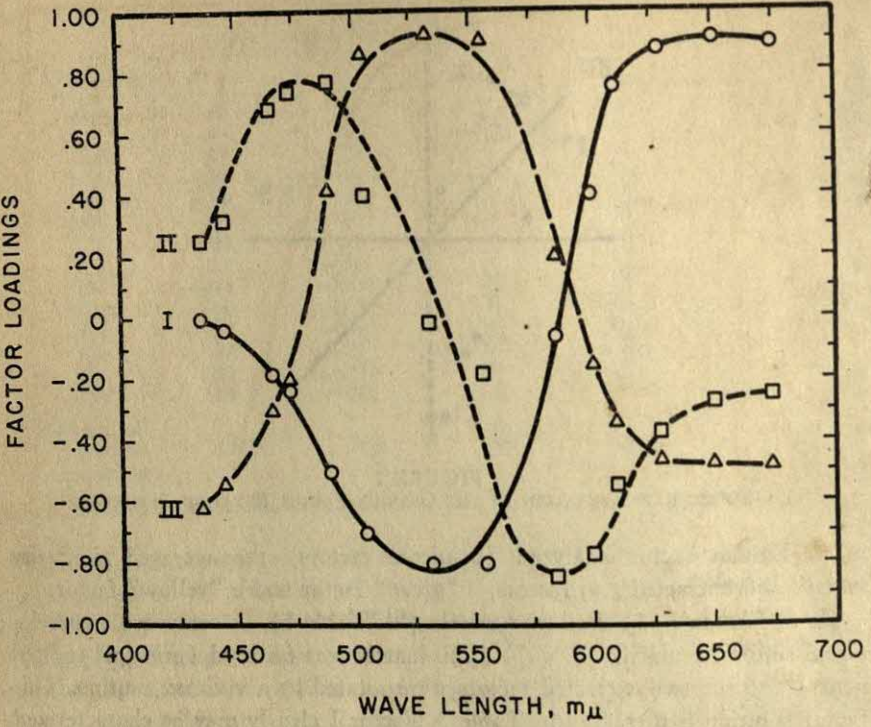

FIGURE 2
FACTORS' LOADINGS PLOTTED AGAINST WAVELENGTH, Mμ

TABLE 3
ORTHOGONAL FACTOR MATRIX

Wave-length	I	II	h^2
522mμ	.96	—.24	.98
546	.91	.38	.98
560	.43	.90	1.00
566	—.18	.97	.98
570	—.37	.92	.99
575	—.97	.25	.99
580	—.99	.05	1.00
Amount of variance accounted for	57%	41%	98%

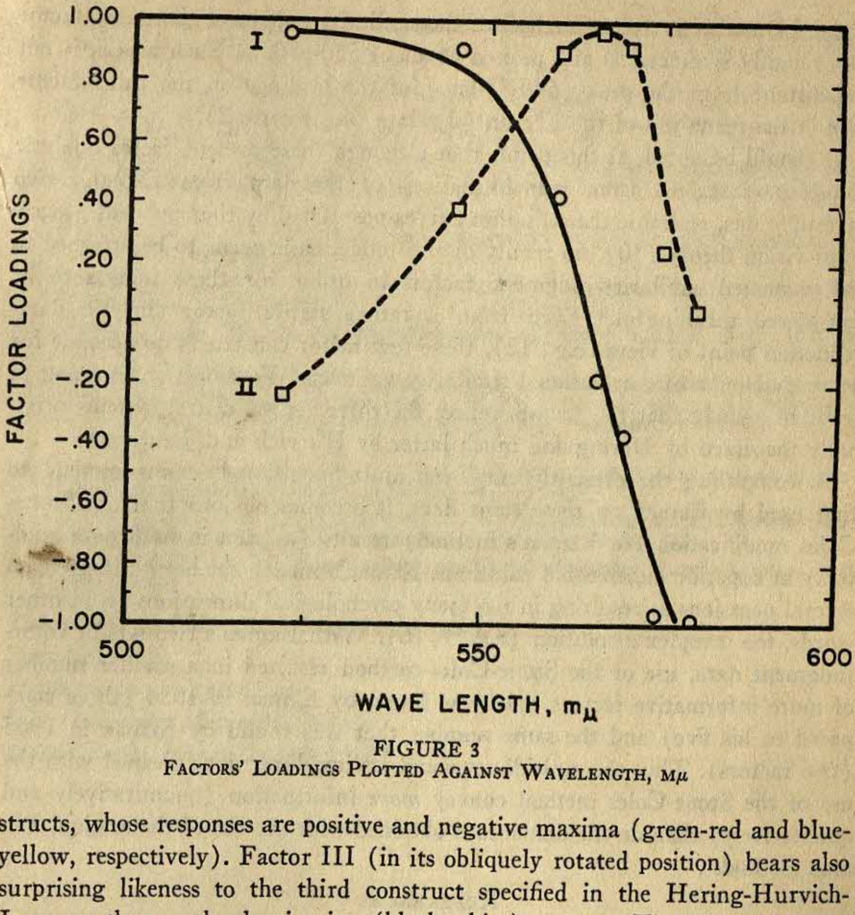

FIGURE 3
Factors' Loadings Plotted Against Wavelength, mμ

structs, whose responses are positive and negative maxima (green-red and blue-yellow, respectively). Factor III (in its obliquely rotated position) bears also surprising likeness to the third construct specified in the Hering-Hurvich-Jameson theory, the luminosity (black-white) system. The symmetry and location of the peak (540-550mμ) of the factor III loadings are most similar to the theorized fundamental luminance sensation function.

The reanalyzed factorial results, based on the Ekman (4) judgmental data, support the reanalyzed factorial solution based on the Ekman (2) data. Although the portion of the color spectrum which provided the stimuli was not broad enough to include complementary or opponent colors, our first factor was bipolar in character. It would seem that the judges recognized that two colors (green and yellow and their combinations) constituted the stimuli. What is surprising is our second factor; no such kind of factor was discernible under Ekman's (4) factor analysis of the similarity matrix. This second factor was roughly symmetrical and peaked at about 560-570mμ. Such a peak is not too distant from the peak (540-550mμ) of the leadings on the third factor seen in the reanalysis of the Ekman (2) data (see Figure 2).

It should be noted, at this point, that although these present factor analytic solutions, extracted from transformations of the data from Ekman's two investigations, resemble the sensation curves postulated by the opponent-process color vision theory (10), no reality or theoretical basis needs to be attached to the extracted similarity-judgment factors in order for these factors to be considered meaningful.[6] Even from a rather sterile factor analytic data-reduction point of view (e.g., 12), these few factor constructs do account for a great amount of correlational similarity variance. We admit it tempting to want to assume that the factors reflect the three retinal-neural systems originally theorized by Hering and much latter by Hurvich and Jameson.[7]

In comparing the presently employed multidimensional scaling method to that used by Ekman on these same data, it becomes obvious that the Stone-Coles modification (to Ekman's method) results (as seen in both data analyses) in superior dimensional solutions. Ekman's model has been criticized on several occasions as resulting in too many psychological dimensions or, in other words, too complex a solution (e.g., 1, 16). With Ekman's two sets of color-judgment data, use of the Stone-Coles method resulted in a smaller number of more informative factors than was found by Ekman in 1954 (three compared to his five) and the same number that was found by Ekman in 1965 (two factors). Thus the multidimensional scaling dimensions gleaned with the use of the Stone-Coles method convey *more* information (quantitatively and qualitatively) than do the dimensions obtained with the use of the original Ekman method.

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[6] Professor Hurvich has been informed of these results and his comment was that "with the [multidimensional scaling] method 'validated' in the color realm it should have wide applicability elsewhere" (personal communication, July, 1970).

[7] It is interesting to note that although Ekman (2) compared his obtained factor structure to constructs postulated by Granit (6) in some of his early work, Granit (7) later is of the opinion that indications from electrophysiology research provide a "belated vindication of Hering's view"; the color vision system seems to be characterized by mutually opponent neural processes.

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THE INFLUENCE OF RANDOM REINFORCEMENT ON HEART RATE DURING EXTINCTION*

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A. INTRODUCTION

The first studies on random reinforcement were effected following the turn of the century (23, 24). After 1930 (26, 30, 33), the amount of research increased to a point where Jenkins and Stanley (14) by 1950 could refer to more than 30 studies proving that there is an increased resistance to extinction as a result of a random reinforcement schedule during learning.

The above observation led to a search of the causal factors. The lack of success in this direction produced a large number of theories of which there were very few empirical validations (15). An examination of cognitive theories—such as expectancy theory (13, 29), cognitive dissonance (5), and field theory (9)—leads one to conclude that they are insufficiently explanatory. Intending to be empirical, they are, however, generalized and offer very few satisfactory operational definitions. In addition, they are diffuse with reference to cognitive and behavioral relations; perceptual and cognitive activities undoubtedly play an important role, but no light is shed as to how mental activity is transformed into observable behavior.

By their lack of precision, these theories of learning offer little grasp of the experimental problem; general and vaguely related to other concepts of the learning theory, they intend to explain all, but in fact they clarify little.

The behaviorist position gave rise to many associationist interpretations, of which the most important are Guthrie's contiguity theory (6) and Hull's mathematico-deductive theory (10, 11). The simplicity of Guthrie's theory hides too many shortcomings (4), and today we tend to agree that Hull's logic was too restricted in its application, premature and too ambitious (7, 8, 19). Further general unsatisfactory concepts were advanced to account for the gaps, to correct, and to define the intervening variables which would explain the effects of random reinforcement, such as discrimination (15, 22), competitive responses (27, 32), mediation responses (12, 15).

Recognizing the inadequacy of traditional explanations and convinced of

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the essential influence of motivation, Melvin H. Marx (19) proposed a new role for the associative and motivational factors in learning. He broadened the concept of motivation to encompass an associative element which he terms habit, and a motivational element which he calls activation. Habit is determined by stimulus-response pairing in the Hullian sense. Activation is related to the degree of energy bound to a particular instrumental behavior, which constitutes an integral part of the habit. The author does not propose a mediating explanatory mechanism: the activation component of the instrumental response is open to all mediating processes which can explain the observed variations in performance. During extinction, the activation component of a given action, which was engendered by reinforcement during learning, will diminish. Several studies support this theoretical position: variations of indices of activation during extinction (2, 17), variations in the value of reinforcement (20, 31), the effect of contrast (1).

Heretofore, no attempt to measure the activational factor has been made in the framework of this theory. The present study attempts to fulfill the needs expressed by Lewis (5) and Rouanet (25) for additional research and investigation of new data. Not only is the intention of this author to validate a theory, but also to study a physiological index of activation. A neurophysiological concept of activation has recently been developed (3), independently of the Marxian theory. This activation, created by the degree of the significance of the situation, may be based on one of two factors: either on the expenditure of energy of the organism, or on a neurological model of which the principal components are reticular (21) and hypothalamic (16). Activation is generally measured by means of peripheral aspects of cortical activity (3), particularly that of cardiac functioning (16).

The present study is an attempt to verify whether the reinforcement schedule is responsible for a higher level of physiological activation during extinction, and whether the activation factor, as defined by Marx, is manifested in heart rate during extinction. This experiment can also be interpreted in a larger theoretical context proposed by W. H. Teichner (28). By means of a model based on the radioelectric concepts of tuning and bandwidth, he tries to throw some light on the functioning of the brain. The second postulate of his model accords to activation the general and diffuse role of alerting the brain centers. It combines its action with that of specific input signals to determine the pattern of cortical tuning whose bandwidth is dependent upon the level of activation. This postulate predicts a direct relationship between the level of activation and response. In the present experiment we would expect to observe during extinction a more sustained response in the random reinforcement group.

The theoretical positions adopted demand the confirmation of the following hypotheses with reference to extinction:

1. Subjects who learned under a random reinforcement schedule would demonstrate a higher HR than subjects of the other group.

2. In both groups we would observe a gradual deceleration in HR; however the response would be less attenuated in the random reinforcement group.

The specific component of activation will be particularly emphasized if (*a*) at the appearance of a significant stimulus, at the beginning of extinction in both groups, the number of accelerations of HR will be greater than the decelerations; (*b*) during extinction, the progressive convergence of the number of accelerations and decelerations is less rapid in the group which learned under a program of random reinforcement.

B. METHOD

1. *Subjects*

Two groups were used, each composed of eight male rats, of the same stock and age, each subject weighing more than 200 gm. The groups were equated according to weight, heart rate (HR), variation of HR at the moment of appearance of a stimulus, and rate of learning in a situation similar to the experimental situation.

2. *Apparatus*

A Grason-Stadler instrumental water distribution box was used. The fixed lever was replaced by a silent, rapid, retractable lever, with an electromechanical-pneumatic control constructed by the author. Such a lever permits separate trials; it renders equivalent the number of times the subjects (*S*s) in either group can press the lever, and the quantity of physical activity expended.

The electric potential which accompanies cardiac activity was measured across two subcutaneous electrodes affixed to both sides of the subject's thorax. The electrodes were sutured to the thigh muscles and emerged near the base of the back where they were connected to a contact weighing approximately 2 gm. The contact transmits the cardiac signal to a Beckman polygram which also registers reinforcements, lever appearance depression and retraction.

The recordings and experimental program are controlled by a Grason-Stadler modular program, series 1200.

3. *Procedure*

The subjects (*S*s) learned to press a lever in order to obtain water under a 24-hour water deprivation schedule. Group I was on a fixed continuous reinforcement schedule. Group II was on a random reinforcement schedule of 1:2. After seven learning sessions the subjects underwent five extinction sessions.

Each session was divided into four separate 10-second trials, the procedure being as follows: (*a*) appearance of the lever in the activity box for (*b*) five seconds during which *S* can press on it, following which (*c*) the lever retracts, and water is delivered according to the reinforcement schedule, (*d*) if the lever is not depressed within five seconds, it retracts automatically. In order to reduce the effects of manipulation and the novelty of the situation, each session is preceded by two minutes of HR stabilization.

C. Results

Figure 1 shows that extinction in Group II (random reinforcement) is slower than in Group I (continuous reinforcement). A linear regression approximation confirms this tendency (Figure 2), $p = .05$. The effects on

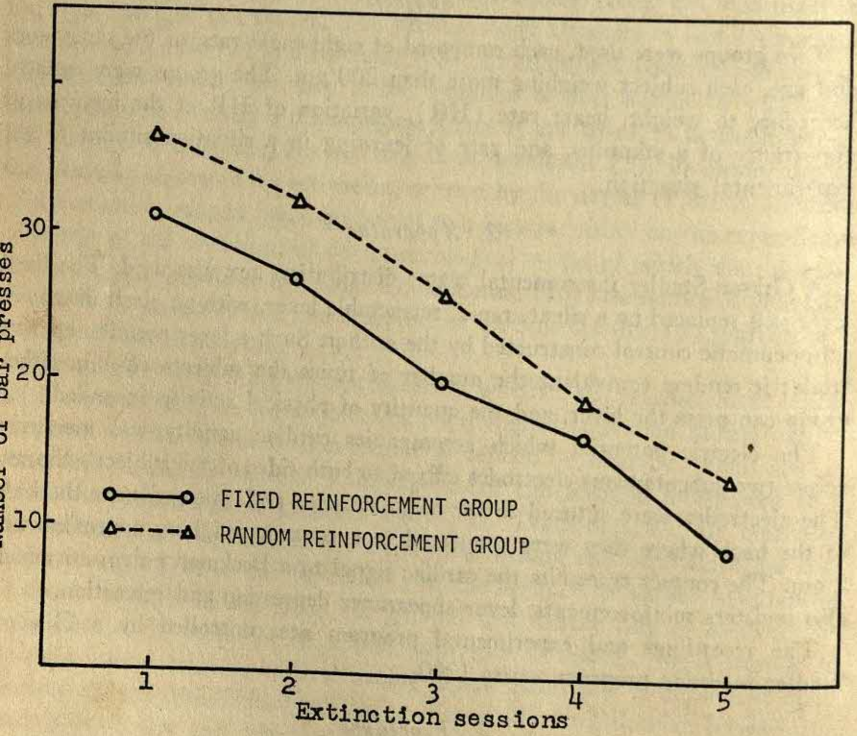

FIGURE 1

Mean Number of Bar Presses per Group During Extinction

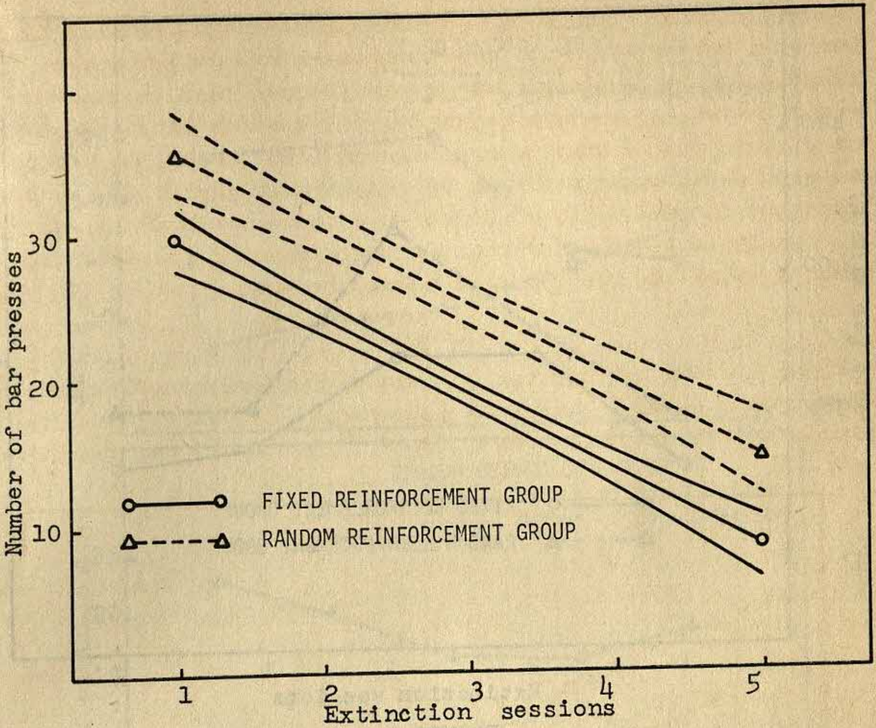

FIGURE 2
LINEAR REGRESSION REPRESENTATION OF MEAN NUMBER OF BAR PRESSES FOR EACH GROUP WITH .05 CONFIDENCE LIMITS

extinction of learning under a random reinforcement schedule confirm that which has been observed by many researchers.

An analysis of the mean HR during extinction supports the hypothesis enunciated. Figure 3 shows that HR of Group II is higher than that of Group I during each session. A more detailed analysis of these sessions, with the use of polynomial regression with .05 confidence limits, reinforces this conclusion. It seems that there is thus a close relationship between the activation level and the performance characteristics of the two groups. It should be noted, as well, that HR for both groups evolves in the form of a reversed U.

Figures 4 and 5 illustrate the direction of HR variation for both groups at the moment of appearance of the lever during all extinction sessions. From these graphs it can be seen that the frequency of accelerations is greater than the number of decelerations, but the difference between these two types of

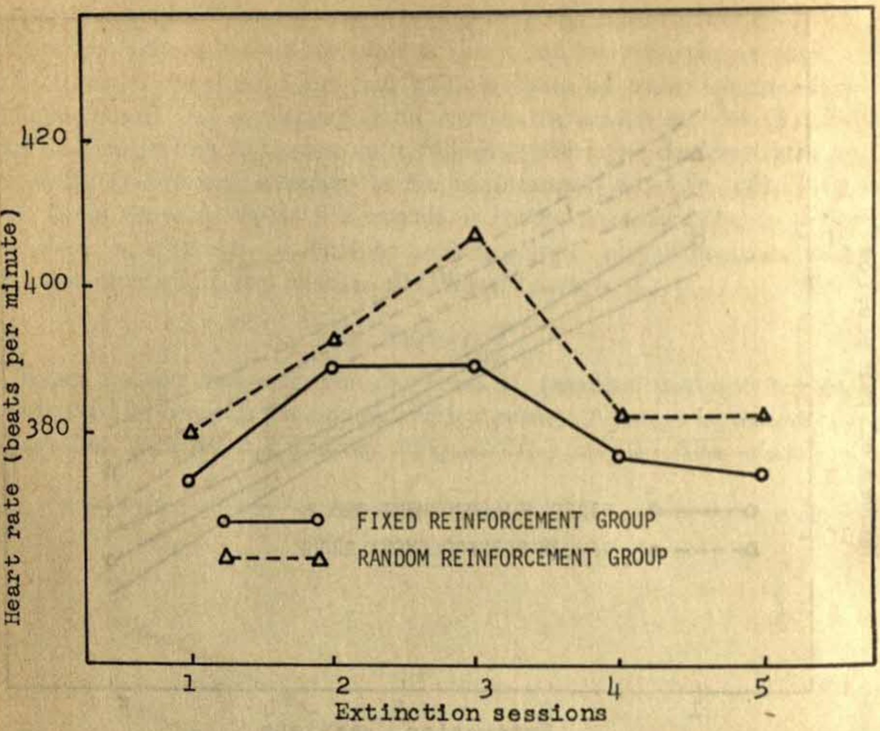

FIGURE 3
MEAN HR OF THE TWO GROUPS DURING EXTINCTION

responses diminishes rapidly. This trend is most marked for the fixed reinforcement group, less so for the randomly reinforced group. The regression lines with their respective 95% confidence intervals (Figure 4) clearly indicate that the greater number of accelerations is maintained for a longer time in the randomly reinforced group. These conclusions are further upheld by a detailed analysis of each session where the results are grouped into five consecutive blocks.

There is a close relationship between performance and heart rate. Thus considering the performances of the two groups, it would seem that Marx's hypothesis is supported. According to this hypothesis, the motivational factor of activation plays the preponderant role. It is this factor, as determined by HR, and not the habit factor, as determined by the number of responses, which seems to account for the prolonged maintenance of the response in the randomly reinforced group. This experiment also seems to confirm Teichner's

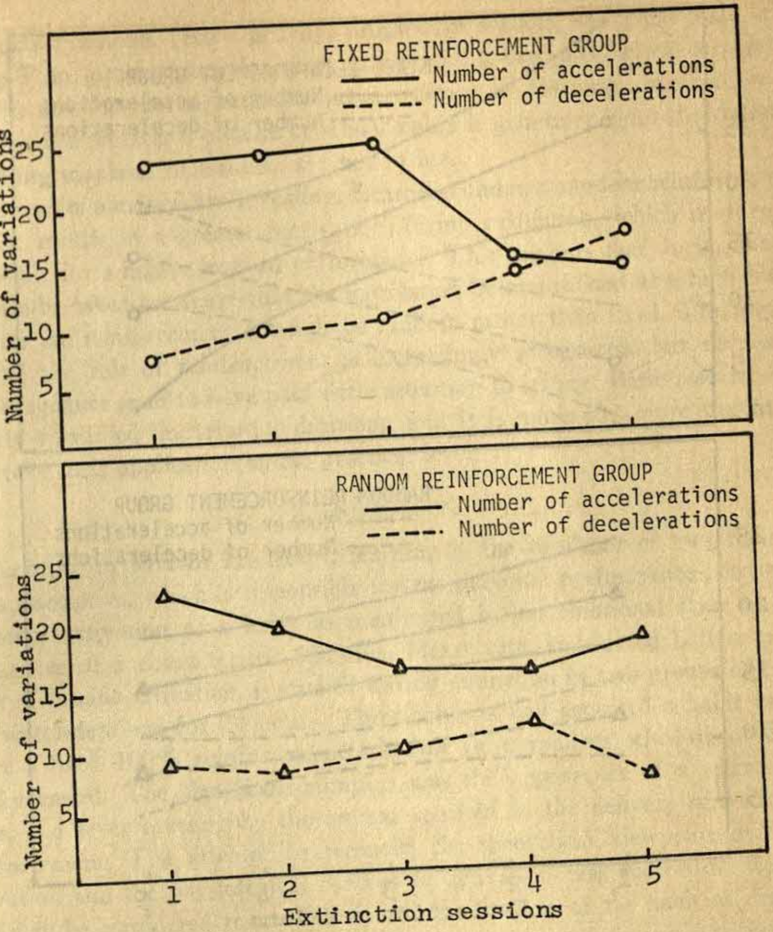

FIGURE 4
NUMBER OF ACCELERATIONS AND DECELERATIONS OF THE HEART RATE OF THE TWO GROUPS OF SUBJECTS AT THE MOMENT OF APPEARANCE OF THE LEVER

second postulate. The frequency of the performance appears to be directly proportional to that of the measured activation. A new analytical approach has been used. During each session, a detailed analysis of the change in mean HR was made by comparing the number of accelerations with the number of decelerations at the moment of appearance of a stimulus. The greater number of accelerations seems to reveal a new and interesting method of analysis. It would permit the rapid determination of the specific level of

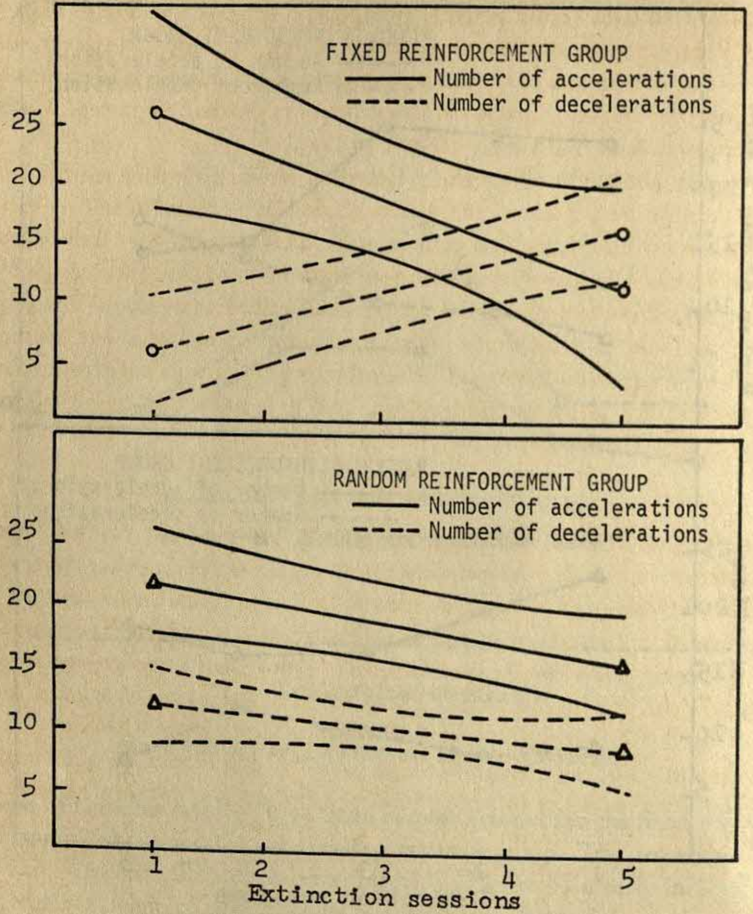

FIGURE 5
Regression Lines with Confidence Level of 95% of the Number of Accelerations and Decelerations of HR of the Two Groups of Subjects at the Moment of Appearance of the Lever

activation of a subject, without referring to a more doubtful concept, that of baseline heart rate.

D. Conclusion

The fact that performance is shown to be the result of two factors, in particular that of activation, suggests certain implications of great value to therapy and education. Certain efforts have been made in education in recent years which are relevant to these factors: for example, the introduction of participatory schools (école active), progressive schools, the Dual Plan, the Trump Plan, programmed learning, and teaching machines. However, motivation is not considered until the actual instant of learning. Motivation in nonreinforced situations outside of school hours is generally ignored. Methods of eliciting maximal motivation are not in use.

The results obtained are revealing. Learning under a random reinforcement schedule results in a greater motivation during extinction, which in turn is responsible for a higher level of performance. This suggests that during learning, care be taken to assure that the motivation be maintained at a high level, and that the reinforcement schedule be random rather than fixed. The importance of the role of reinforcement is increasingly recognized, but therapists and pedagogues seem to have paid little attention to its use. Basic research has recently furnished important indications, and it is more and more urgent to undertake their application at the practical level.

E. SUMMARY

According to Melvin H. Marx, learning is the resultant of two factors: one is associative, which is responsible for the maximal performance potential; the other activation of a habit as manifested by an emotional state at the appearance of a characteristic stimulus. Heart rate, considered herein as an index of specific activation, is studied during extinction in two groups of eight rats water-deprived for 24 hours. These subjects had acquired a habit under either a fixed 100% reinforcement schedule or a random schedule of 50% reinforcement. The significant stimulus was the appearance of a retractable lever, and lever pressing by the animal resulted in the delivery of water as reinforcement. The attempt to reconcile the theoretical viewpoint of habit activation and the physiological concept of activation was successful. Activation may be considered responsible for the prolonging of the habit as demonstrated by the group which learned under a random reinforcement schedule. In effect, a close relationship is verified between the performance of each group and mean heart rate level. A similar relationship is observed between performance and variations in heart rate at the moment of appearance of the lever. The group that learned by means of random reinforcement evidenced more heart rate accelerations over decelerations for a longer period of time during extinction than did the fixed reinforcement group. This experiment also seemed to confirm a model proposed by W. H. Teichner in an attempt to bring together the concepts of activation, information processing, and memory. A direct relationship between level of activation and quality of performance was observed, as predicted by the second postulate of the model.

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SCHOOL-RELATED PERCEPTIONS IN HANDICAPPED CHILDREN*[1]

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A. INTRODUCTION

Recently there have been many ideas and proposals to upgrade both general and special education. It is interesting to note, however, that the children themselves do not typically participate in the formulation of these recommendations. Even information on how pupils view school curriculum and personnel is limited. While pupil observations represent but a single facet of the complex dynamics of the school community, in the opinion of the writers no efforts to improve education in general, and special education in particular, can be fairly and completely judged successful unless this dimension is taken into consideration. Accordingly, it seems desirable that studies be conducted on children's school-related perceptions to establish a baseline for future program revisions.

Coleman (6) and Tannenbaum (15), among others, gave some evidence that academic concern does not occupy a central place in the mind of a typical secondary school student. Even so, a question remains whether a student reacts uniformly to every academic subject, as well as to every type of school-related people. In a study of 105 British secondary school students, Wright (20) suggested that these adolescents were more closely identified with their parents than with their teachers. Of 800 pupils in grades six through nine, Yamamoto, Thomas, and Karns (23) studied the semantic differential responses to curriculum concepts (*social studies, language, science, mathematics*) and people concepts (*classmates, parent, teacher, self*). While no overall sex differences were found, there was a monotonic decrease in favorableness of ratings on both categories of concepts (curriculum and people) as grade level increased. However, these main effects were actually concealing complex interactions among pupil, sex, grade, and concepts.

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A dearth of information on pupil perceptions is more pronounced in the case of exceptional children than of normal ones. In their surveys of literature on the various types of handicapped children, neither Cruickshank (7) nor Kirk and Weiner (9) has even a single reference to pupil attitudes toward people and curriculum areas in the classroom. However, Neale and Proshek (12) reported that, among 350 culturally disadvantaged children in the fourth, fifth, and sixth grades, a systematic change in school-related attitudes occurred to make their evaluations of such concepts as *my teacher, my classroom, me, my school books, following rules, talking in front of class, or having to keep quiet* increasingly negative as grade in school increased.

While self-concept and attitudes have been studied in general terms with disturbed children, there has been little study of their specific perceptions of school milieu. Only one major study, that of Morse, Cutler, and Fink (11) has obtained responses from maladjusted children through a questionnaire as to how they perceive the classroom situation. Two-thirds of the pupils saw the problems of behavior and achievement as accounting for their placement in special public school classes. Reading led the frequency list of academic areas giving them the most difficulty. They indicated that the one thing they would like to change most about their special class was the other children. Peer relationships appeared to be a serious problem because of the intensity of relationship in the smaller groups and because of the high saturation of children with problems. These pupils indicated they liked the *teacher*, *the classroom activities*, and the *special help* they received.

Recently Thomas, Yamamoto, and Morris (19) studied the semantic differential responses of 68 disturbed children ranging in age from 10 to 16 years. Four people concepts (*classmates*, *parent*, *teacher*, *self*) and four curricular concepts (*social studies*, *language*, *science*, *mathematics*) were rated by each student. Ratings on adults (*parent*, *teacher*) were higher than ratings on children (*classmates*, *self*) on the factors of Movement and Security, but on Merit *teacher* was viewed as the least favorable of the four people concepts. On the Vigor factor for curricular concepts, these children viewed *science* as most vigorous with *mathematics* in second place, and *language* and *social studies* falling in less favorable positions. The relatively high scores on the Certainty factor indicated that these children perceive the various curricular areas as safe, easy, usual, and familiar.

For the area of mental retardation, the *Bibliography of World Literature on Mental Retardation* (8) lists only two studies both by the same group of investigators. Butler, Gutherie, and Gorlow (4, 5) administered a 150-item self-attitude questionnaire, which was highly similar to the Minnesota Multiphasic Personality Inventory (MMPI), to 100 educable female retardates ranging in age from 14 to 18. The factor analytic studies identified three favorable and four unfavorable attitude clusters to describe general personality traits. However, these studies did not explore the retardates' perceptions of any specific classroom variables.

In literature related to blind and deaf children, no research has been found to bear upon their attitudes toward curriculum areas and school personnel (1, 2, 3).

To fill the obvious gap in attitudinal research on exceptional children, the present study examined the differential perceptions of specific curricular areas and school-related personnel among mentally retarded, emotionally disturbed, blind, and deaf children as a function of sex, school level, and type of handicap.

B. PROCEDURE

1. *Subjects*

Eight-hundred subjects, ranging in age from 10 to 16 years originally participated in the study, 200 each from the four handicapped groups: namely, mentally retarded, emotionally disturbed, blind, and deaf. Subjects were subsequently divided into groups by school level: middle school (ages 10 to 13) and high school (ages 14 to 16). To allow for the familiar imbalance in sex ratio among the handicapped (a larger number of boys than girls) and to meet the requirements of proportionality in the analysis of variance design (10), a random selection of protocols was made from each of the subgroups for subsequent analyses. For the mentally retarded and emotionally disturbed groups, 30 middle school boys, 30 high school boys, 20 middle school girls, and 20 high school girls were respectively selected. Likewise, for the blind and deaf groups, 45 middle school boys, 45 high school boys, 30 middle school girls, and 30 high school girls were selected. Thus the total sample became 500 subjects.

The emotionally disturbed children came from several special treatment centers in a midwestern state, all of which employed the psychoeducational approach (11, p. 29). These children were defined as disturbed by their psychiatric admission as inpatients. The educable mentally retarded, ranging in intelligence quotient from 60 to 80, were in a large urban public school system in the South. The blind subjects whose main channel of learning is through braille reading came from a state institution in the Southeast which employed a progressive training approach, while the deaf children came from two state institutions in the Southwest emphasizing an oral approach. Multiply-handicapped children were excluded from the study.

Due to the nature of the subjects, research with these children is under various situational constraints to a far larger extent than in the case of normal pupils. That is to say, selection of these subjects is necessarily opportunistic and no legitimate claim for comprehensiveness or representativeness can be made. A couple of institutions declined to participate in the study on seemingly respectable grounds, while others did so on patently defensive reasons. Nevertheless, we believe it important to share the information obtained from the willing institutions at this time, since such is the only way to build a useful inventory of information on handicapped children by reducing ignorance, uncertainty, and provincialism.

2. *Method*

A semantic differential instrument constructed by the investigators was administered to the subjects in small group settings under qualified school personnel. Each subject rated four people concepts (*classmates*, *parent*, *teacher*, *myself*) on nine seven-point, bipolar scales and four curriculum concepts (*social studies*, *language*, *science*, *mathematics*) on another, but overlapping, set of eight scales.

Two separate forms of the semantic differential were prepared after pretesting with each type of handicapped children. On each, people and curriculum concepts were alternated, while the sequence within each category was random. Within each form the order of individual scales was also randomized, while the polarity of scales was randomly balanced in direction half and half on each form and it was reversed between the two forms. Furthermore, these forms were randomly distributed to subjects upon administration. In addition, two forms of a practice instrument, using the same 17 scales but different concepts (*doctor* and *spelling*), were prepared and administered to the students prior to the main data gathering instrument to familiarize them with the procedures. A special braille version of both the practice and main instruments was prepared for the blind subjects under the guidance of an experienced educator of the blind. No incidence of difficulty was reported in the process of data gathering.

In a factor analytic study with a 24 scale instrument, Yamamoto, Thomas, and Wiersma (22) using a largely Caucasian population of normal seventh and ninth graders identified three people factors, Movement, Security, and Merit, and two curriculum factors, Vigor and Certainty. On the basis of factor analyses executed on the present data, the results of which are detailed elsewhere (18), as well as of Rybolt's corresponding findings (14) on the similarity in semantic structures between normal and retarded adolescents,

TABLE 1
FACTORS, SCALES, AND FACTOR LOADINGS[a]

Concept rated	Factor	Scale	Loading
People	Movement	Moving-Still	.81
		First-Last	.60
		Fast-Slow	.78
	Security	Easy-Hard	.72
		Similar-Different	.68
		Familiar-Strange	.66
	Merit	Wise-Foolish	.65
		Good-Bad	.69
		Big-Little	.69
Curriculum	Vigor	Alive-Dull	.60
		Large-Small	.76
		Strong-Weak	.78
		Fast-Slow	.64
	Certainty	Safe-Frightening	.68
		Easy-Difficult	.69
		Usual-Unusual	.74
		Familiar-Strange	.78

[a] Permission received from the publisher of *Psychology in the Schools* to reproduce data originally published therein (22).

the same factors were utilized to derive five scores for analysis. The factors, individual scales, and factor loadings are summarized in Table 1.

For each factor in each concept category (people and curriculum), a factor score was obtained for each subject by summing his scores on those seven-point semantic differential scales belonging to the particular factor. Since there were three scales assigned to each people factor and four to each curriculum factor, an individual subject's factor score ranged from 3 to 21 on people ratings and 4 to 28 on curricular ratings. These factor scores were then analyzed by Lindquist's extended Type III analysis of variance (pupil sex × pupil grade × pupil handicap × concept) with repeated measures on the last dimension.[2]

C. RESULTS

1. *People Ratings*

a. Movement. Table 2 presents mean scores on the Movement factor. The analysis revealed one main effect (people) and one first-order interaction effect (people-handicap) to be significant at the .01 level, while one first-order interaction effect (sex-handicap), one second-order interaction effect (people-sex-

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[2] Detailed tables of mean scores and analyses of variance are available from the authors upon request. In the subsequent discussion, only the summary descriptions are given.

TABLE 2
MEAN MOVEMENT SCORES FOR PEOPLE CONCEPTS

Handicap	*N*	Sex	Age group	People			
				Classmates	Parent	Teacher	Myself
Retarded	30	M	MS	14.67	16.03	14.70	14.00
	20	F	MS	13.45	16.45	14.90	15.05
	30	M	HS	13.03	14.77	13.73	14.57
	20	F	HS	13.45	17.55	15.60	14.80
Disturbed	30	M	MS	12.73	15.87	15.60	13.67
	20	F	MS	14.20	16.30	14.35	14.30
	30	M	HS	13.77	16.50	14.30	16.80
	20	F	HS	13.55	13.95	15.50	12.50
Blind	45	M	MS	14.02	13.96	13.56	13.31
	30	F	MS	13.37	15.20	14.93	14.40
	45	M	HS	13.36	14.04	13.69	14.00
	30	F	HS	13.70	15.70	13.23	13.33
Deaf	45	M	MS	14.98	15.18	15.13	15.51
	30	F	MS	14.50	14.23	14.07	13.80
	45	M	HS	13.76	14.02	14.29	14.42
	30	F	HS	13.37	13.73	13.63	13.20

age), and one third-order interaction effect (people-sex-age-handicap) were significant at the .05 level. Another main effect (handicap) was significant at the .10 level.

The mean overall rating for *parent* (15.04) was the highest rating, while *classmates* (13.78) received the lowest, with *teacher* (14.37) and *self* (14.24) falling in between. This particular rank order was the same for each of the handicapped groups, although there was a significant interaction between people and handicap. For all people concepts the emotionally disturbed gave the highest rating (14.68), followed by the mentally retarded (14.43), the deaf (14.32), and the blind (13.94).

The third order interaction provides evidence of some complexity among sex, age group, handicap, and people concepts. While boys (14.39) and girls (14.31) noted people concepts about the same, middle school children (14.54) had more favorable perceptions of people than did high school children (14. 18). The general picture is one of adults being viewed more favorably than youth, and self being viewed more favorably than peers. Exceptions to this are the high school boys who gave *self* (14.80) the most favored position with *parent* (14.67), *teacher* (14.00), and *classmates* (13.49) following it. The high school girls, on the other hand, ranked themselves in the lowest position (13.42). Generally, mentally retarded and the emotionally disturbed subjects provided more favorable ratings than did the blind and deaf children. For example, *parent* received a rating of 16.04 by the emotionally disturbed and

15.76 by the mentally retarded, while the blind children rated this concept 14.58 and the deaf children 14.35. The overall ratings given by the blind children were the lowest of the four handicapped groups.

b. Security. The mean scores for the Security dimension are presented in Table 3. The analysis revealed one main effect (people) and two first order interaction effects (sex-handicap; people-handicap) to be significant at the .01 level, while one second order interaction effect (sex-age-handicap) was significant at the .05 level.

TABLE 3
MEAN SECURITY SCORES FOR PEOPLE CONCEPTS

				People			
Handicap	*N*	Sex	Age group	Classmates	Parent	Teacher	Myself
Retarded	30	M	MS	12.57	15.03	13.63	13.30
	20	F	MS	11.80	13.90	13.55	14.20
	30	M	HS	12.77	13.33	12.87	13.57
	20	F	HS	14.05	13.85	14.55	14.65
Disturbed	30	M	MS	12.93	14.60	13.30	12.87
	20	F	MS	11.90	13.75	13.10	13.10
	30	M	HS	13.77	15.50	13.67	15.27
	20	F	HS	12.60	11.30	12.00	10.65
Blind	45	M	MS	12.89	14.44	11.69	13.29
	30	F	MS	13.60	14.43	11.80	13.60
	45	M	HS	12.71	13.69	10.87	12.69
	30	F	HS	13.37	14.30	13.17	12.93
Deaf	45	M	MS	12.04	12.44	12.02	12.22
	30	F	MS	13.67	14.53	13.07	13.50
	45	M	HS	13.69	14.11	12.31	13.20
	30	F	HS	13.17	14.53	11.93	13.17

On security as on Movement, the overall mean for *parent* (14.01) was in first position. But in contrast to Movement, *self* (13.22) was ranked in second position, *classmates* (12.98) in third position, and *teacher* (12.55) in fourth position. The mentally retarded (13.57) and emotionally disturbed (13.11) students perceived *teacher* in third rank, while the lowest rank for *teacher* was provided by the blind (11.76) and the deaf (12.30) students. Three of the handicapped groups, the mentally retarded (13.83), the emotionally disturbed (13.19), and the blind (13.10) placed *self* in second rank, though in each case there was a considerable quantitative difference between *self* and *parent*. These differences account for the significant people-handicap interaction.

Overall means for girls (13.28) were slightly higher than for boys (13.14). Middle school boys (12.99) perceived people concepts less favorably than middle school girls (13.28), high school boys (13.38), and high school girls (13.77). Emotionally disturbed middle school girls (12.96) provided a rather low rating for the people concepts, while emotionally disturbed high school girls (11.64) were even harsher. Middle school deaf boys (12.18), as well as blind high school boys (12.49), also gave unfavorable ratings for people concepts. These variations in rating account for interaction among sex, age group, and handicap.

c. Merit. For the Merit factor the mean scores are presented in Table 4.

TABLE 4
MEAN MERIT SCORES FOR PEOPLE CONCEPTS

Handicap	*N*	Sex	Age group	People			
				Classmates	Parent	Teacher	Myself
Retarded	30	M	MS	14.83	16.63	16.17	14.27
	20	F	MS	12.85	17.40	16.35	16.75
	30	M	HS	14.30	16.13	15.83	15.37
	20	F	HS	12.20	17.60	16.85	13.20
Disturbed	30	M	MS	12.97	14.47	13.73	12.17
	20	F	MS	13.30	17.50	16.35	14.65
	30	M	HS	12.17	16.43	14.47	14.30
	20	F	HS	12.80	14.50	14.95	12.40
Blind	45	M	MS	13.91	16.47	14.36	14.20
	30	F	MS	13.07	17.30	14.27	15.33
	45	M	HS	14.00	16.60	14.56	14.71
	30	F	HS	13.30	16.67	15.00	12.93
Deaf	45	M	MS	15.00	17.13	16.00	15.69
	30	F	MS	16.20	17.17	15.90	15.53
	45	M	HS	14.62	16.22	15.44	14.98
	30	F	HS	14.47	16.70	14.77	13.83

Two main effects (handicap; people), as well as one first order interaction effect (people-handicap), one second order interaction (people-sex-age), and one third order interaction effect (people-sex-age-handicap) were significant at the .01 level. In addition, two first order interaction effects (sex-age; people-sex) and one second order interaction effect (people-sex-handicap) were significant at the .05 level.

Again, as with the Movement dimension, *parent* (16.55) was rated in first position, *teacher* (15.22) in second position, *self* (14.47) in third position, and *classmates* (13.90) in the fourth position. This ranking, as was the case with Movement, held across the four handicapped groups. However, when the four people concepts were combined, the deaf students (15.61) gave the most favorable ratings, followed by the mentally retarded (15.43), the blind (14.81), and the emotionally disturbed (14.15).

There was no difference in ratings between boys (15.00) and girls (15.08); however, middle school boys (14.37) gave lower ratings than middle school girls (15.62), and high school girls (14.55) gave lower ratings than high school boys (15.03). Deaf middle school girls (16.20) gave the highest overall rating and emotionally disturbed middle school boys (13.33) and disturbed high school girls (13.66) gave the lowest overall ratings. These variations account for the significant interaction among people, sex, age, and handicap.

d. Distance (D) Among People. When considering the three factors together, the distance functions (13) among the four concepts calculated from overall means are as follows: *myself-classmates*, .77; *myself-teacher*, 1.01; *classmates-teacher*, 1.51; *parent-teacher*, 2.08; *myself-parent*, 2.36; and *classmates-parent*, 3.11. The closeness of self and classmates is easy to understand because they belong to the same generation, while the gap is rather large between different generations (*classmates-teacher, myself-parent,* and *classmates-parent*). The large distance between parent and teacher is in part due to the low Security rating given *teacher.*

e. Distance Among Handicapped Groups. Distance functions among handicapped groups, calculated from overall means, fall within a smaller range than did those among the people concept. The *D*s are as follow: mentally retarded-deaf, .57; blind-deaf, .89; mentally retarded-blind, .95; emotionally disturbed-blind, 1.03; emotionally disturbed-mentally retarded, 1.33; and the emotionally disturbed-deaf, 1.53. The largest distance found between disturbed and deaf children seems due to the fact that the emotionally disturbed rated people considerably more positively than did the deaf.

2. *Curriculum Ratings*

a. Vigor. Table 5 gives the mean scores for curriculum on the Vigor factor. The analysis revealed two main effects (handicap, curriculum), as well as one first order interaction effect (curriculum-handicap) to be significant at the .01 level.

In terms of Vigor, *science* (18.58) was rated in first place with *language* (18.40) in a close second position, followed by *mathematics* (18.01) and *social studies* (17.80). However, no two handicapped groups ranked the subject areas in the same manner. *Science* was in first position for the mentally retarded (19.31) and the emotionally disturbed (18.72) students, while *language* held the top rank for blind (17.68) and deaf (19.65) students. *Social studies* was rated in the lowest position by mentally retarded (18.14) and emotionally disturbed (16.20) students, but in second position by the deaf (19.43) children. When all subjects areas were pooled, the deaf children

TABLE 5
MEAN VIGOR SCORES FOR CURRICULUM CONCEPTS

Handicap	N	Sex	Age group	Curriculum			
				Social Studies	Language	Science	Mathematics
Retarded	30	M	MS	17.30	18.93	18.90	19.10
	20	F	MS	20.35	12.25	19.70	19.40
	30	M	HS	17.90	18.07	18.87	18.47
	20	F	HS	17.55	17.85	20.20	17.75
Disturbed	30	M	MS	17.10	17.30	19.33	18.87
	20	F	MS	15.55	18.10	19.05	18.45
	30	M	HS	16.90	17.27	19.07	18.40
	20	F	HS	14.45	16.45	16.95	15.10
Blind	45	M	MS	17.64	17.42	17.22	16.73
	30	F	MS	17.20	17.10	17.23	14.67
	45	M	HS	16.73	17.36	18.24	17.62
	30	F	HS	16.23	19.13	17.93	15.53
Deaf	45	M	MS	19.38	19.89	19.42	19.93
	30	F	MS	19.90	20.17	19.57	19.17
	45	M	HS	19.44	20.00	18.87	18.89
	30	F	HS	19.00	18.23	17.53	19.00

(19.32) provided the most favorable ratings, followed by the mentally retarded (18.72), emotionally disturbed (17.52) and blind (17.18) children. Sex and age were not important dimensions for the Vigor factor.

b. Certainty. The mean scores for Certainty are given in Table 6. The analysis of variance revealed two main effects (handicap, curriculum) to be significant at the .01 level. No interactions were significant.

Language (18.81) was considered the most certain of the academic areas by these handicapped students, while *social studies* (18.11) and *mathematics* (18.06) claimed about equal weight for second position. The least certain was *science* (17.93). However, no two handicapped groups ranked the subject areas alike. *Language* claimed first place with the emotionally disturbed (19.01), the blind (18.64), and the deaf (18.57), but only second place with the mentally retarded (19.24). On the other hand, *science* was perceived as least certain by the mentally retarded (18.99), the emotionally disturbed (17.57), and the deaf (17.85), while the blind (17.53) placed it in third rank. *Mathematics* was rated the most certain of subjects by the mentally retarded (19.48), in second position by the emotionally disturbed (18.25), in third place by the deaf (18.41), and in fourth position by the blind (16.65).

Significant differences among the handicapped groups reveal that the mentally retarded (19.18) were the most certain about academic areas, while the

TABLE 6
MEAN CERTAINTY SCORES FOR CURRICULM CONCEPTS

				Curriculum			
Handicap	*N*	Sex	Age group	Social Studies	Language	Science	Mathematics
Retarded	30	M	MS	18.23	19.17	20.43	20.00
	20	F	MS	20.30	20.90	20.10	20.60
	30	M	HS	19.50	18.53	17.87	18.73
	20	F	HS	18.10	18.75	17.40	18.70
Disturbed	30	M	MS	18.73	18.40	18.30	18.57
	20	F	MS	17.90	20.85	19.75	18.65
	30	M	HS	17.07	18.13	17.77	19.57
	20	F	HS	17.20	19.40	14.00	15.40
Blind	45	M	MS	17.64	17.51	17.82	16.80
	30	F	MS	17.87	18.43	16.80	15.90
	45	M	HS	17.58	18.29	17.64	17.11
	30	F	HS	18.33	21.07	17.67	16.47
Deaf	45	M	MS	18.29	18.78	18.09	19.16
	30	F	MS	18.10	18.40	18.40	19.30
	45	M	HS	18.62	19.02	18.38	17.69
	30	F	HS	16.77	17.77	16.13	17.47

blind (17.66) were the least certain. The deaf (18.22) and the emotionally disturbed (18.15) ranked about the same on the Certainty dimension.

While the overall sex differences were nonsignificant, the boys (18.29) were slightly more certain than the girls (18.13). Although not statistically significant, the age group differences are also interesting. The overall mean for middle school students was 18.52 as opposed to 17.94 for the high school students. Mentally retarded, emotionally disturbed, and deaf middle school children had higher certainty ratings than high school students of the same handicapped groups. The exception to this was the blind group (17.35) in which the high school students (18.02) were more certain. Broken down by subject area, middle school students rated the areas as follows: *social studies*, 18.28; *language*, 18.80; *science*, 18.52; and *mathematics*, 18.46. On the other hand, high school students' ratings were *social studies*, 17.94; *language*, 18.83; *science*, 17.33, and *mathematics*, 17.66.

c. Distance Among Curricula. The distance functions on curricular concepts have a small range indicating that these subject areas were perceived more or less alike. The *D*s follow: *social studies-mathematics*, .24; *science-mathematics*, .58; *social studies-science*, .80; *language-mathematics*, .85; *language-science*, .90; and *language-social studies*, .92.

d. Distance Among Handicapped Groups. A larger range is evident when distance functions among handicapped groups rather than among subject areas are calculated from overall means on curricular concepts. They are as follow: emotionally disturbed-blind, .60; mentally retarded-deaf, 1.13; mentally retarded-emotionally disturbed, 1.59; emotionally disturbed-deaf, 1.80; mentally retarded-blind, 2.16; and blind-deaf, 2.21.

D. DISCUSSION

The favorable image of *parent* seems to cut across all groups of children on all three factors, Movement, Security, and Merit. Wright (20) found British secondary school students to favor *parent* over *teacher*. *Parent* was in top position with Negro, Mexican-American, and Navajo Indian middle school children (17) as it was with disturbed children (16, 19). And, finally, normal middle school children (23) likewise placed *parent* in the prime position. The all too familiar cries of the disintegration of the family and the generation gap notwithstanding, parents remain a potent figure in children's life space. In performing their tasks of socialization, education, and remediation, schools ought not to ignore parental influence. Especially in quasi-total institutions for handicapped children, careful coordination of efforts with parents seems imperative for the good of their charges.

On the two dimensions, Movement and Merit, the adults (*parent* and *teacher*) received more favorable ratings by the handicapped than the contemporaries (*self* and *classmates*). The substantial rating on Merit received by the *teacher* agrees with Morse *et al.* (11) who found this to be true of maladjusted children. But on the Security dimension these handicapped children placed *teacher* in the lowest position. From the mental hygiene point of view we understand that security in the learning situation is a necessity to produce psychological comfort which, in turn, enhances the use of the student's potential. As teachers of handicapped children, as well as teachers of teachers, we need to improve in this aspect of our professional work. The low teacher standing on Security had been found also with normal children (23) and with Negro, Mexican-American, and Indian children (17).

Of the two concepts of the younger generation, *self,* in general, ranked in third position after *parent* and *teacher*. The exception was on the Security dimension on which *self* had a second position. Again in agreement with Morse and his associates (11) *classmates* generally ranked in the lowest position among disturbed youth; this was also the situation among the other handicapped groups.

With normal children, Yamamoto, Thomas, and Karns (23), as well as Neale and Proshek (12) have found a decrease in favorableness of rating as age increased. The present findings agree to some extent with these previous results. Among the handicapped, most of the ratings for people concepts were lower for high school age than for middle school age students. Exceptions were mentally retarded and deaf students on Security. In this investigation sex of student did not influence people ratings by the handicapped, a fact which agrees with the nonsignificant sex differences found among normal children (23).

The gradual building of self-esteem observed in normal children (23) was not the case with all handicapped students. In general, the older the mentally retarded and the emotionally disturbed, the higher their self ratings, with the emotionally disturbed students showing larger differences. An exception to be noted is that, on Merit, the mentally retarded high school students rated themselves lower than the middle school students. In the case of blind and deaf pupils there was a decrease in self ratings at the high school level as compared with the middle school group. In only one case, that of deaf children on the Security factor, did the self-esteem increase at the high school level. If confirmed in longitudinal studies, such failure to build self-esteem in the academic milieu as adolescence progresses is again a serious mental health problem. This may be a more critical period for deaf and blind adolescents than for others, but certainly it is a problem confronting the special education profession. Further investigation on this failure of positive self-development in deaf and blind students is in order.

In curriculum ratings by the handicapped children, sex was again not influential, while type of handicap and curricular areas were significant on both factors, Vigor and Certainty. On Vigor, *science* and *language* all but tied for first position, while on Certainty *language* is clearly in first position. It is possible that the perception of *language* as the most vigorous area by the deaf and blind children could be expected because of the weighting it receives in their curriculum. Neither the mentally retarded nor the emotionally disturbed rated it as most vigorous. For them *science* is the most vigorous. While the overall ratings, in general, were similar in magnitude for normal and handicapped children on the Vigor factor, the normal middle school students rated *language* in fourth position and *mathematics* in first position. By normal, as well as the handicapped children, *social studies* was rated in an unfavorable position on both curricular factors. What can be done for the lagging social studies curriculum? Is the social studies curriculum of today realistic for handicapped children, especially the mentally retarded, blind, and deaf? Again these differences in ranking of academic areas need more study in order to understand student preferences and needs at different age levels.

In terms of the decrease in feelings of Certainty by the high school age students as compared to the middle school students, this investigation agrees with Yamamoto, Thomas and Karns (23) in their study with normal students. As age increased, the students indicated less Certainty. This follows along with the failure of these handicapped adolescents to build self-esteem as they grow older. The struggle for identity is certainly not encouraged by uncertainty in academic areas. This is true for the emotionally disturbed, as well as for the other handicapped groups who are not receiving therapy. Thus it seems that the educator needs to consider this problem of lack of certainty in given academic areas. Perhaps curricular revisions should be investigated to see whether any changes occur in Certainty ratings by the students as a result of given program changes. We need to know more about creation of secure feelings in academic areas for our handicapped children.

To be noted is the fact that these handicapped groups were more heterogeneous in their reaction on people than on curricula. Their interpersonal difficulties are reflected in the greater range of ratings. Perhaps traditional pedagogical methods still exist to such an extent that subject areas are no longer viewed as dynamic and interesting, hence the small range in attitudes toward curricular areas. Perhaps classroom interaction analysis, both on the cognitive and affective domains, would be a way to delineate further the problems and difficulties that center around people, as well as curriculum, concepts.

Why, for example, should the teacher be rated so low on the Security dimension? Is it that teacher educators fail to provide within their own students an understanding of individual differences and need systems within children? Or, is it that these teacher educators fail to offer the students strategies of dealing with these needs and differences? Is it that we fail in "on-the-spot-learning" during supervision of practice teaching. Long distant supervision is not very helpful and appropriate, for the real situation has vanished and we tend to talk of it in abstract, distant terms.

Of importance also is the observation that there is no such thing as a monolithic "handicapped" or "exceptional" group. Large differences among groups are evident, since on people and curriculum concepts, there were significant handicap effects, as well as concept effects. In the face of this kind of evidence, it would be rather difficult for us to justify an identical training program for all special education teachers. If divergent programs are impossible to maintain because of lack of trained personnel and expense, a teacher preparation curriculum should at least produce a diagnostic, analytical teacher. If, in their preparation, students were taught to analyze the affective and cognitive dynamics of the class they are teaching and to develop techniques to cope with these divergent needs and interactions among pupils, they could then begin to guide the children and the learning milieu in a positive direction. One of the difficulties in providing such a teacher-preparation program lies in the fact that most teacher educators do not have their own classrooms of handicapped children. One cannot systematically teach something one does not know and practice oneself.

Whatever their origins may be, the handicapped students' perceptions should not be ignored by curriculum planners, since the meaningfulness and, hence, the motivation for learning will largely depend upon the psychological significance and interest each subject matter holds for the students' minds at various levels of school life. Such an inside-out view of school personnel and curriculum complements the traditional outside-in observation used in defense of either the *status quo* or any of the numerous proposed innovations. No program will be effective unless students' perceptions, which precede and accompany any desired behavioral changes, are taken into consideration.

These findings, as well as the technique itself, should be useful in teacher education. First, it is imperative for the teachers-to-be to be keenly aware of their future students' perceptions of school curriculum and personnel so as to avoid unnecessary mistakes and to plan for constructive actions. Second, it is equally important for them to know their own perceptions through application of such a technique so that they may realize their own biases and prejudices and that they may ponder the similarities and differences between their own and their students' perceptions. Through such a process, attitudinal change toward a more positive learning situation will gradually develop.

E. SUMMARY

A semantic differential was administered to 500 middle school and high school retarded, disturbed, blind, and deaf children, ages 10 to 16, to study their attitudes toward four people (*classmates, parent, teacher, myself*) and four curriculum (*social studies, language, science, mathematics*). Significant handicap effects were found on all concepts, indicating that there is no monolithic handicapped group, and suggesting divergent teacher preparation programs for each group. These handicapped children were more heterogeneous in their reaction to people than to curricula, their interpersonal difficulties being reflected by a greater range of ratings. On all factors, *parent* claimed the prime position. *Teacher* received second rank on Movement and Merit, but the last rank on Security, raising concern relative to the mental hygiene dimensions in the classroom. *Self,* in general, ranked third, and *classmates,* fourth. A decrease in self-esteem as age increased was found, while sex differ-

ences were, in general, nonsignificant. On curriculum ratings, *science* and *language* all but tied for first position on Vigor; on Certainty *language* was clearly in the prime position. *Social studies* fared rather poorly in the ratings, especially for the retarded, blind, and deaf. With each handicapped group at both the middle school and high school levels, these data indicate a need for a psychological re-examination of the current curriculum structure and the present teacher preparation programs.

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BEHAVIOR IN COMPLEX LEARNING SITUATIONS INVOLVING THREE LEVELS OF DIFFICULTY*

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A. INTRODUCTION

The purpose of this report is to collate and organize certain essential similarities in the results of three related research investigations. The major purposes of the studies were (*a*) to determine whether rats can learn to solve multiple-path elimination problems of varying degrees of complexity, (*b*) to investigate hypotheses regarding the relationship between decision time at a point of choice and correctness of response, and (*c*) to ascertain the degree of stereotypy or variability of responses in "free" choice multiple-path elimination problems during learning and after the learning criterion had been achieved.

B. METHOD

1. *Subjects and Apparatus*

Subjects were three groups of albino rats. Apparatuses (see Figure 1) consisted of elevated circular platforms from which three, four, or five paths radiated, adjacent paths being separated from each other by 30°. Each path was three inches wide and five feet long. Eight inches from the distal end of each path was an obstruction plate in which was located a closed door that could be locked or unlocked by the experimenter and behind which food was located. Subjects were admitted to the circular choice platform after being placed backwards on a starting stand and passing through a tunnel opposite the battery of radiating pathways.

Study A involved the three-path apparatus. Subjects ($N = 11$) were given 200 trials (2).

Study B involved the four-path apparatus. Subjects ($N = 9$) were given 160 trials (3).

Study C involved the five-path apparatus. Subjects ($N = 7$) were given 200 trials (1).

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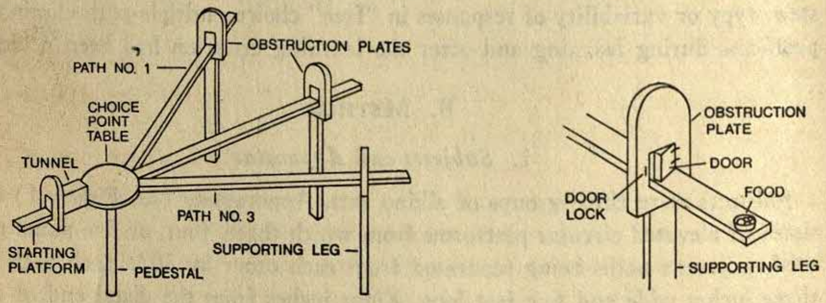
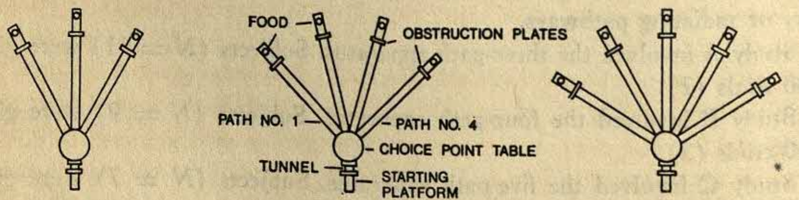
2. *The Problem*

The problem for the subject was to choose different paths in *any* sequence on successive runs each day. The order of elimination of the paths was determined by the subject. After each correct run the animal received food at the distal end of the path and then the door in the obstruction plate on the path chosen was locked. On each occasion (i.e., run) that a subject chose a path after having chosen it previously that day, it would find the door locked and the choice was tabulated as an error. A day's trial, therefore, consisted of as many runs as necessary for the animal to select all the correct paths; in other words, the number of runs in a trial was equal to the number of correct paths plus the number of incorrect choices (errors). Each run, whether following an error or a correct response, began from the starting stand and required the subject to pass through the tunnel. There was one trial per day as described above; animals were run on 22- to 26-hour food deprivation schedules.



ELEVATED MULTIPLE-PATH APPARATUS

REAR VIEW DETAIL OF OBSTRUCTION PLATE



THREE PATH PROBLEM

FOUR PATH PROBLEM

FIVE PATH PROBLEM

FIGURE 1
ELEVATED MULTIPLE-PATH APPARATUSES

3. *Learning Criterion*

The criterion of learning on any apparatus was choosing successively different paths in any order in the minimum number of runs on each of four consecutive days.

C. RESULTS

1. *Learning Proficiency*

On the three-path problem all 11 subjects attained the criterion of learning. The best learner required six trials to achieve the criterion, the poorest 36; the mean number of trials was 19.4. The mean number of errors per animal committed during the study was 59.9. There was a mean of 27.4 errors before the criterion of learning was attained and a mean of 32.5 errors after the learning criterion was attained. Precriterion errors averaged 1.41 per trial, postcriterion errors .18 per trial.

On the four-path problem all nine subjects attained the criterion of learning. The best learner required 19 trials, the poorest 154 trials; the mean number of trials for learning was 74.6. The mean number of errors committed throughout the investigation was 209.3 of which 163.4 were committed before the criterion was attained and 45.9 afterward. Precriterion errors averaged 2.2 per trial, postcriterion errors .5 errors per trial.

On the five-path problem six of the seven subjects attained the criterion of learning. The best learner required 35 trials, the poorest 138 trials; the mean number of trials for those who attained the criterion was 75.7. One animal, however, had not attained the criterion when the experiment was discontinued at the end of 200 trials. (If performance of the nonlearner is counted as 200 trials, then the precriterion mean becomes 93.4 trials.) Precriterion errors averaged 2.3 per trial, postcriterion errors .6 per trial.

2. *Decision Time*

Correct choices were made more rapidly than incorrect choices in all three studies.

For the three-path problem, postcriterion choices were more rapid than precriterion choices. For the four-path problem, precriterion choices were made more rapidly than postcriterion choices. For the five-path problem, differences between time of precriterion and postcriterion choices were not significant.

Throughout all three studies and in terms of both precriterion and postcriterion decision times, correct choices were made significantly more rapidly than incorrect choices. Uniformly, then, less time was required to make a correct response than to commit an error.

The mean time to make a correct choice or to make an incorrect choice tended to increase as the number of previous correct choices increased during the trial.

3. *Stereotypy and Variability in Performance*

Stereotyped behavior, in the sense that the animal rigidity repeated the same sequence of response on successive trials, did not occur: i.e., animals did not adopt any precise order or pattern of path elimination on any of the problems. Rather, variation in the pattern of response on successive trials was characteristic of the subjects; they employed different response sequences to solve each problem on consecutive days, while maintaining high accuracy of performance. For example, a subject might have as many as 30 or more consecutive trials without error and, yet, rarely repeat the same pattern of response on two successive days. This tendency to avoid repetition of the same response sequence was characteristic of all animals and of all problem situations.

4. *Preference for Noncontiguity and the Maximum Divergence Principle*

Furthermore, successive pathways selected in any given pattern (on any day's trial) tended to diverge maximally: i.e., the subjects tended to select on a given run a pathway that was maximally different in terms of spatial orientation from the pathway chosen on the immediately previous run. In other words, there was an avoidance on successive runs of contiguous path sequences and a definite preference for the most noncontiguous pathways—maximum divergence—on successive runs.

The data analysis procedure can be illustrated for the four-path problem. A chart of 24 behavioral patterns—i.e., the 24 possible permutations of four correct choices—was constructed and a "divergence" score assigned to each pattern according to the following rationale: If the contiguous paths in a pattern were selected successively, a divergence value of three units is assigned. For example, if after choosing Path 1, the animal chooses Path 2, that is but one unit away and therefore has a divergence value of one; if it then selects Path 3, that, too, has a divergence of one; and if Path 4 is next selected, there is another divergence of one. Hence, the pattern 1234 (and this would apply to 4321, as well) has a total divergence of three units. As another example, 4-1-3-2: Choosing Path 1 after Path 4 constitutes a divergence of three units; Path 3 divergences by two units from Path 1; and the succession 3-2 yields another (that is, one more) unit of divergence. Thus, there is a divergence value of six units for the path sequence 4132.

A trial for an animal on any day falls into one of the 24 patterns, each of which is classifiable in terms of a divergence score, which, as defined, has a range of 3 to 7.

The absolute number of possible patterns varied from one divergence category to another: i.e., there were only two possible patterns which would yield a divergence of three units, four possibilities for a divergence score of four units, 12 possibilities for a score of five units, four possibilities for six units, and two possibilities for seven units. It is, therefore, necessary to give appropriate consideration to the chance factor.

Since there were two chances (of the 24 possible combinations) of running a pattern with a divergence of three units, the total number of choices with divergence of three was divided by a weighting factor, 2, in order to obtain a mean preference for patterns with a divergence value of three units. Since there were 12 possibilities of a pattern with a divergence of five, the total number of choices with a divergence of five was divided by a weighting factor of 12, in order to obtain the mean preference score for patterns with a divergence of five. Other groups of data were similarly treated. This general rationale can be extended to the three- and five-path problems.

Examination of Table 1 discloses that there is a definite preference for divergence over contiguity in the choice of paths on successive runs; the greater the divergence value of a behavior pattern, the stronger the preference for that pattern.

D. Discussion

In all three problem situations, subjects learned not to repeat running down a particular path after they had been rewarded for such a run. They learned to select successively different paths on consecutive runs in a given trial.

In all three studies, subjects made correct choices more rapidly than incorrect choices (for several subjects, many times more rapidly). This result is consistent with the idea that prior to incorrect runs the subject is uncertain, bewildered, or confused—i.e., aspects of the situation are unclear to the animal—whereas prior to a correct choice there is an absence or at least a lesser degree of such confusion or bewilderment—i.e., a greater degree of certainty.

Despite opportunities for performing beyond the learning criterion, stereotypy in the sense that the animal displayed a rigid preference for a particular response sequence did not develop in any subject. Rather, animals learned to solve each problem, not by a specific set of responses, but by learning a principle; and they varied their response sequences from trial to trial while performing in compliance with that principle: viz., "Choose successively different

TABLE 1

SEQUENCES OF CORRECT RESPONSES

Three-path problem	Units of divergence	
	2 units	3 units
Specific sequences of paths	123 321	132 213 231 312
Absolute no. of choices	222	1978
Weighting factor	1/2	1/4
Degree of preference	111	494.5

Four-path problem	Units of divergence				
	3 units	4 units	5 units	6 units	7 units
Representative sequences of paths	1234 4321	2134 1243	3124 4123 2143	4132 2314 3241	3142 2413
Absolute no. of choices	17	110	620	238	455
Degree of preference	1/2	1/4	1/12	1/4	1/2
Weighting factor	8.5	27.5	51.7	59.5	227.5

Five-path problem[a]	Units of divergence							
	4 units	5 units	6 units	7 units	8 units	9 units	10 units	11 units
Representative sequences of paths	12345 54321	12354 54312	12435 45312	12534 35412	13425 23154	15342 41325	14253 52413	31524 25143
Absolute no. of choices	4	14	52	190	174	354	254	305
Weighting factor	1/2	1/4	1/14	1/32	1/18	1/28	1/14	1/8
Degree of preference	2	3.5	3.7	5.9	9.7	12.6	18.1	38.1

[a] One subject in this group died after 147 trials; it had attained the learning criterion in 43 trials.

paths on successive runs." Apparently, when there is an opportunity to solve a problem by learning either a rigid sequence of responses or an abstract principle, it is easier to learn the abstract principle.

Not only did the animals not stereotype, but they did not show a preference for selecting paths in a contiguous order. In fact, the preference was in the direction of noncontiguity or divergence for all three problems. Thus, not only did animals learn to respond in terms of a principle of nonrepetition of recently rewarded responses, but they displayed a preference on successive runs for paths that are maximally different in terms of spatial orientation. The picture, then, was one of learning to solve a problem and doing so by developing pattern preferences that involved choosing a succession of noncontiguous paths, and varying the pattern (i.e., sequence of choices) on consecutive days much more often than not.

Subjects displayed behavioral flexibility, shifting from one approach to another as circumstances required while maintaining behavior in the direction of the same goal and while performing at a very high level of accuracy.

Evidence has been cited by others, as well as by the present investigator, suggesting a tendency in the rat to avoid paths that it has previously travelled, even though previously reinforced for such path selection; this finding deserves further research consideration and elucidation.

In conclusion, one implication consistent with this series of research studies is that the alternation behavior frequently observed and reported for rats in the two-path problem is but a specific instance of a more general principle, now well supported by evidence: *viz., that animals given the opportunity will vary their behavior and tend to choose, on successive runs, paths which diverge maximally from each other*. By virtue of the physical nature of the two-path apparatus, such variability and divergence in behavior is of necessity limited to alternation.

E. SUMMARY

Multiple-choice problems involving three, four, and five elevated paths in which the order of elimination was determined by the subject were learned by rats. Correct decisions were made more rapidly than incorrect choices. Subjects did not develop stereotyped sequences of responses. There was rather a trend toward employing different response sequences to solve each problem on consecutive days, while maintaining high accuracy of performance. Furthermore, successive pathways selected in any given pattern (or day's trial) tended to diverge maximally: i.e., the subjects tended to select on a given run a pathway that was maximally different in terms of spatial orientation from the pathway

chosen on the immediately previous run. Alternation in the two-path situation is a specific instance of a more general maximal divergence principle: viz., that animals given the opportunity will vary their behavior and tend to choose, on successive runs, paths which diverge maximally from each other. By virtue of the physical nature of the two-path apparatus, such variability and divergence in behavior is of necessity limited to alternation.

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THE UTILITY OF BEHAVIOR MANAGEMENT TECHNIQUES IN CHANGING INTERRACIAL BEHAVIORS* †

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AND HENRY B. ANDREWS

A. INTRODUCTION

Recently, behavior management techniques have been applied to quite an array of classroom behaviors (4, 5, 6). Such procedures as contingent teacher attention, peer reinforcement, and role modeling have been used successfully to alter task relevant and disruptive classroom behavior. One area that has been relatively untouched in behavior modification studies is biracial interaction. Can the extent to which black and white students interact with each other be altered via systematic social reinforcement?

The vigorous attempts of the U.S. Department of Health, Education, and Welfare (HEW) and the federal courts to achieve a balanced distribution of blacks and whites in public school systems is apparently based on the premise that physical desegregation will lead to social integration. However, there is little empirical evidence to corroborate this assumption. Several studies indicate that social integration is by no means an inevitable result of physical desegregation (1, 2, 3, 7, 8). Simply putting blacks and whites together does not assure that they will interact with each other or develop increased affinity for each other.

The present study is based on the premise that the achievement of social integration between blacks and whites must be deliberately planned for within the school setting. Otherwise, social integration is not likely to occur. The current investigation appraised the efficacy of five behavior management procedures, contingent teacher reinforcement, peer reinforcement, role modeling, group reinforcement counseling, and a control condition, in altering interracial behaviors.

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B. Method

1. *Subjects*

The junior high school used in this study was located in a metropolitan area of Tennessee. At the time of the study the school was drawing students from (*a*) an all-black section of the city, (*b*) an all-white Ku Klux Klan (KKK) type neighborhood, and (*c*) a desegregated housing project. Prior to 1965 the school was all-white. In 1965, the school's first year of desegregation, 20 percent of the student body was black. For the next three years the school had a 50-50% racial balance. In 1969-1970, when the study was conducted, the racial distribution was 60% blacks and 40% whites. Theoretically, with this kind of racial balance a student has about as much opportunity to interact with the opposite race as with his own race. However, sociometric data collected during the 1968-1969 school year indicated that the school was sharply polarized with respect to race (8).

The subjects were selected from five classes which had racially balanced enrollments (near 50-50%). In each class, six black racial isolates and six white isolates were identified via sociometric data as follows. Students in each class were administered eight social situations dealing with routine classroom activity, informal play activity outside the classroom, inviting friends to their home, sponsored school activity within the community milieu, formal extracurricular activity at school, seating patterns for meals at school, intellectually demanding activity at school, and school-related social functions. For each situation the students were asked to identify the three students from their class with whom they would most like to share the experience and the three students with whom they would least like to share the experience.

Students who gave and received the *lowest* number of biracial choices, while giving and receiving the *highest* number of biracial rejections, were identified as racial isolates. A total racial isolation score based on all eight situations was computed for each student by adding biracial choices given and received and subtracting from that total biracial rejections given and received. Since very few biracial choices were given and a great many biracial rejections were given, the total racial isolation score was negative for most students. However, students obtaining the most negative scores in each class were identified as racial isolates.

To corroborate the premise that the students identified as biracial isolates were significantly more isolated than other members of the class, a comparison was made between the isolates' scores and those of 12 other students selected randomly from the remaining class members. Analysis of variance indicated that the isolates' scores were significantly ($p < .0001$) more negative than the nonisolates scores at the beginning of the study. Isolates in the five treatment groups did not differ significantly from each other at the outset of the study. Posttreatment assessment indicated that the isolates had become significantly ($p < .0001$) less negative in their total racial isolation scores, whereas the nonisolates had become slightly more negative.

2. *Treatments*

Although individual isolates were not randomly assigned to treatments, the treatment conditions were randomly assigned to the five classes. Therefore, the probability that an isolate would wind up in a particular treatment condition was the same as for any other isolate. Treatment implementation was initiated immediately after the Christmas holidays and continued through May 15. Implementation of treatments was monitored by observers from the University of Tennessee. With the exception of the teacher reinforcement condition, each treatment and control group was observed four periods a day for the duration of the treatment. Since only three teachers participated in the teacher reinforcement treatment, this group was observed just for those three periods.

a. Teacher Reinforcement. The *S*s selected for this treatment condition were 12 seventh graders, six black (five boys and one girl) and six white (three boys and three girls) students. Two female teachers (one black and one white) and a white male teacher were the sources of social reinforcement for the isolates. This treatment was based on the assumption that the most important social relationship in the classroom is that between a student and his teacher. The *E*s felt that a student's relationship with his teacher could have a decisive impact on his behavior toward other students, particularly members of the opposite race. Previous observation of teacher behavior had indicated that most junior high school teachers criticize students much more frequently than they praise them. It is likely that this criticism produces considerable hostility toward the teacher, and when students are not allowed to express that hostility directly, they seek other targets—e.g., members of the opposite race—for their hostility. It was hypothesized, therefore, that reinforcing (e.g., praising, touching, listening to) students would improve the teacher-student relationship and, consequently, the student-student relationship in the classroom.

Teacher training consisted of several meetings with the three teachers to acquaint them with the principles of social reinforcement, the treatment instructions on reinforcing appropriate behavior and ignoring inappropriate behavior, and examples of the treatment procedures demonstrated on video tape.

After the treatment conditions were introduced, each teacher was video-taped in his class. Teachers then viewed their own video tapes and the taped sequences of the other teachers. The next phase of training consisted of the *E*s teaching the treatment classes for one day and the teachers recording the frequency and kind of social attention the *E*s gave to each *S*.

Throughout treatment implementation, observers recorded the frequency and type of teacher attention (verbal praise, smiles, touch, or any other social interaction) to appropriate *S* behavior and to inappropriate *S* behavior. With this information, the *E*s provided feedback to each teacher concerning his effectiveness in reinforcing the isolates. During treatment the amount of attention given appropriate student behavior was several times as great as attention to inappropriate behavior. It was not uncommon for a treatment teacher to attend to appropriate behavior of the isolates 50 times or more during a class session, while attending to inappropriate behavior no more than once or twice. One of three teachers consistently had more than 60 instances of attending to appropriate isolate behavior and no instances of attending to inappropriate behavior.

b. Peer Reinforcement. The *S*s selected for the peer reinforcement condition were 12 seventh graders, six blacks (four males and two females) and six whites (four males and two females). Three black and three white students who gave and received the highest number of biracial choices in the class, who received a high number of choices from within their own race, and who gave and received few biracial rejections served as the peer reinforcers for the racial isolates. The reinforcers were trained via video-taped demonstrations and role play to attend to (praise, smile, touch, talk, listen) appropriate behavior emitted by the isolates and ignore inappropriate behavior.

The class participating in this part of the study was together for four periods a day. Each reinforcer was assigned an isolate to work with each period. Assignments were made on a rotating basis so that each reinforcer worked with each isolate several times during the course of the treatment. Students selected as isolates were never told they were "isolates" nor was the purpose of the study discussed with them. Furthermore, students selected as peer reinforcers were never told that their targets were "racial isolates."

Throughout the treatment, observers recorded the type and frequency of interaction between the reinforcers and the isolates. Each reinforcer was observed for two class periods a day. Observers were instructed to approve verbally peer reinforcers for desirable reinforcement behavior. In addition, peer reinforcers were given tangible rewards (mainly edibles) once a week for appropriate interaction with isolates. Throughout treatment, most reinforcers exhibited a higher frequency of intraracial interaction than biracial. The high point of biracial interaction between reinforcers and isolates was obtained after about one month of treatment.

The peer reinforcement treatment was based on the rationale that a major reason why students are racial isolates is because of the dearth of positive reinforcement received from members of the opposite race. If a student consistently receives reinforcement from members of the other race, it is likely he will develop a greater affinity for that race. Simply stated, a person will not continue to dislike and avoid individuals who are being nice to him.

c. *Role Modeling*. The six black (four males, two females) and six white (five males, one female) isolates who served as *S*s for the role modeling treatment were in the eighth grade. The role models were students who gave and received the highest number of biracial choices, received a high number of choices from their own race, and concomitantly gave and received the lowest number of biracial rejections. Biracial triads (problem solving groups) comprised of an isolate *(I)*, a role model *(RM)* of the *I*'s race and a high status model *(HSM)* of the opposite race were the major vehicles of treatment administration. Triads were conducted on a daily basis in each of the four classes attended by the isolates and models. Triad members and group activities were scheduled so that each *I* worked in a triad once every three class days. Triad members engaged in a variety of tasks ranging from working on assigned subject matter to constructing model cars, playing word games, conducting experiments in science, working on class reports and discussing problems in school. Each *RM* and *HSM* served in one triad per day. The behavior of each *RM* and *HSM* was observed for the duration of a triadic session.

A crucial objective in this treatment was the achievement of appropriate interaction between (*a*) the *RM* and the *HSM* and (*b*) the two models and the *I*. To attain this objective, the students functioning as models were trained to interact appropriately with other students. These appropriate behaviors consisted of talking to members of the opposite race in the triad, praising the other group members, listening attentively to members of the opposite race in the triad, and minimizing criticism of other triad members.

Training procedures consisted of having models read a previously prepared script, engage in spontaneous role playing, and view video tapes demonstrating treatment techniques. Throughout the study an *E* met with the *RM*s and *HSM*s once a week to give them feedback concerning the appropriateness of their behavior (based on the observers' report) and to dispense various tangible rewards. In addition, teachers were instructed to reinforce the triad members for working together as a group.

The rationale for the role modeling treatment was based on the Bandur and Walters' role modeling paradigm. Simply stated, the role modeling paradigm suggests that human beings learn to behave as they observe others behaving. However, a child is more likely to imitate a model that he perceives as being similar to himself than one he perceives as dissimilar. Children are also more likely to imitate a model they view as having some degree of status and one who is reinforced for the behavior in question. The role modeling treatment in the current study attempted to incorporate these basic components of the Bandura and Walters' role modeling paradigm.

d. Group Process. The 12 isolates used in this treatment condition were selected from a section of the eighth grade. The *S*s were divided into two small groups with three white and three black students in each group. The same *E* acted as leader for both groups. Each group met for one hour each week to discuss problems related to their school and community. All group sessions were conducted outside the classroom. Most of the early group discussions dealt with teacher-student conflicts, but the *E* suggested several topics dealing with racial issues—e.g., black-white dating, "gang" conflicts between blacks and whites, racial feelings within the group, and parental racial prejudice—which were discussed in the later meetings.

In both groups the *E* provided social reinforcement for any *S* response judged to be appropriate to the group process. Social reinforcement for relatively positive intraracial interaction usually consisted of a smile or head-nod with a concomitant statement of "Good," or "I like what you said." Positive interracial interaction was followed by more extensive social reinforcement, usually consisting of a verbal summarization of the *S*'s remark plus a verbal indication that the opposite race group member had agreed with what had been said.

The group process treatment was based on the assumption that a candid exchange of feelings between blacks and whites may be indispensable to achieving racial harmony. However, open expression of feelings could lead to greater disharmony unless negative feelings are somehow weakened in intensity and positive feelings strengthened. The group leader attempted to accomplish this objective by selective reinforcement of positive interracial interaction.

Although all group sessions were conducted outside the classroom, this treatment group received the same number of in-class observations during treatment implementation as the other treatment groups.

e. Control. Six black (one male, five females) and six white (four males, two females) isolates from a section of the seventh grade served as control *S*s. They received the same number of in-class observations as other treatment groups, but no treatment was employed with them.

3. *Dependent Variables*

Pre- and posttreatment assessments were made for two major types of variables: (*a*) sociometric choices and rejections, and (*b*) behavioral interaction between blacks and whites. The pretreatment dependent measures were collected during the latter part of November, 1969, and the posttreatment measures during the latter part of May, 1970.

a. Sociometric indices. The eight social situations used to select isolates, peer reinforcers, and role models were employed in the pre- and posttreatment assessment of sociometric choices and rejections. For each situation, the students were asked to identify three other students with whom they would like to share the experience and three with whom they would not like to share the experience. Choices and rejections were summed across the eight situations to yield the following dependent measures: (*a*) number of biracial choices given, (*b*) number of biracial choices received, (*c*) number of mutual biracial choices, (*d*) number of biracial rejections given, and (*e*) number of biracial rejections received. A total racial isolation score was computed for each subject by adding number of biracial choices given and received and subtracting from that total biracial rejections given and received.

b. Behavioral interaction. The more important dependent variable in the study was actual interaction between blacks and whites in a classroom setting. During the one week of pretreatment assessment and the one week of posttreatment assessment, four teachers in each treatment group concluded the formal lesson activity in the treatment classes 15 minutes before the end of the period. The students were told they could have the rest of the period to move around the room and talk with whomever they wished. Therefore, each treatment class experienced 60 minutes of free interaction time each day of pre- and posttreatment assessment. During this free time, isolates were observed with respect to their interaction with members of the opposite race. Because of a plurality of observers in some classes, each group of isolates was observed for a total of 105 minutes per day and each isolate close to 10 minutes per day.

The observers classified the isolates' behavior into three major categories: biracial verbal interaction, biracial nonverbal interaction, and none of the above (mainly included intraracial interaction). Biracial verbal interaction consisted of talking or listening to a member of the other race and nonverbal interaction of a physical gesture—e.g., hand waving, winking, smiling—directed toward a member of the other race.

In recording behavior, the observers used rating sheets delineated into five second time intervals. At the end of each five-second time interval the observer recorded the major behavior emitted by his isolate during the interval. Each observer observed a single isolate for five minutes at a time. Therefore, during five minutes of observation, the observer recorded 60 behavioral incidents. The observer was kept abreast of the time via an audio tape calibrated in five-second time intervals. Ear plugs were used in monitoring the tapes.

Observer training consisted of rating video-taped segments of classroom biracial interaction. Each observer continued to rate behavior until he achieved at least 80% agreement with the trainer (one of the *E*s). Percentage of agreement was computed by dividing the number of agreements by number of agreements plus disagreements.

C. Results

The effects of specific treatments on biracial measures were established via a three-dimensional mixed, analysis of variance design. The design included two between variables, race (black, white) and treatment (teacher reinforcement, peer reinforcement, role modeling, group process, control), and one within variable(pretreatment, posttreatment).

1. *Sociometric Indices*

The major index of biracial sociometric relationships was the total racial isolation score. Analysis of results revealed a pre-post main effect positive change for all groups on this variable. The Group Process and Role Modeling isolates made the greatest gains and the Control group the least gain. However, differences between groups in amount of gain were not statistically significant. Analysis of a significant race by time (pre-post) interaction indicated that whites made significantly greater gains than blacks on the total racial isolation variable. Mean racial isolation scores for all groups at the pre- and posttreatment levels are included in Table 1.

Most of the pre-post differences in total racial isolation scores can be accounted for by decrements in number of biracial rejections given and received. The five treatment groups yielded a pre-post main effect reduction ($p < .001$) on both variables. The Group Process and Role Modeling *S*s yielded the greatest reduction in number of rejections given, whereas the Control Group made the least reduction. On rejections received, the Group Process *S*s yielded the greatest decrement and the Peer Reinforcement and Control groups the least decrement. None of these differences between groups in amount of decrease was statistically significant. Analysis of a race × treatment × time interaction indicated that whites in the Peer Reinforcement and Role Modeling

TABLE 1
GROUP MEANS FOR TOTAL RACIAL ISOLATION SCORES

					Differences[a]	
Treatment group[b]	Pre Racial means	Pre Group means	Post Racial means	Post Group means	Pre-post differences in racial means	Pre-post differences in group means
I-B	—25.167	—27.250	—18.833	—20.000	6.334	7.250
I-W	—29.333		—21.167		8.166	
II-B	—26.833	—34.917	—25.667	—30.917	1.166	4.000
II-W	—43.000		—36.167		6.833	
III-B	—28.500	—26.917	—21.500	—19.083	7.000	7.834
III-W	—25.333		—16.667		8.666	
IV-B	—26.667	—28.417	—17.500	—10.250	9.167	18.167
IV-W	—30.167		— 3.000		27.167	
V-B	—27.167	—27.417	—28.167	—16.083	—1.000	11.334
V-W	—27.667		— 4.000		23.667	

[a] Since all mean scores are negative, a decrease from pre- to post-treatment is considered a positive change and an increase a negative change.

[b] Treatment groups: I-B = Peer reinforcement-Black; I-W = Peer reinforcement-White; II-B = Control-Black; II-W = Control-White; III-B = Teacher reinforcement-Black; III-W = Teacher reinforcement-White; IV-B = Group process-Black; IV-W = Group process-White; V-B = Role modeling-Black; V-W = Role modeling-White.

groups decreased significantly more than blacks with respect to biracial rejections given. Biracial choices given, biracial choices received, and mutual biracial choices remained essentially unchanged from pre- to posttreatment assessment. The only significant finding of major relevance on these variables was an A × B × C interaction for biracial choices given. Analysis of this interaction indicated that blacks in the Group Process condition gained significantly from pre- to post, but that whites did not.

2. *Behavioral Interaction*

In the analysis of biracial behavior, the verbal and nonverbal biracial behavioral categories were combined. A time main effect indicated that all groups in combination increased significantly ($p = .03$) from pre- to posttreatment. Of these groups, the Peer Reinforcement and Teacher Reinforcement groups made the most substantial gains and the Control Group the least gain. Again, differences in amount of gain were not significant. Despite gains on these measures by some groups, the percentage of biracial behavior remained far below the percentage of intraracial behavior.

D. DISCUSSION

Two factors in the current study make it hazardous to affirm the superiority of any one treatment in changing interracial measures. One factor was the failure to obtain a significant treatment by time interaction. The significant pre-post main effect on both major dependent variables, in combination with nonsignificant treatment × time interactions, indicates that the groups did not differ in amount of gain at the .05 probability level. A second factor delimiting the generalizability of the findings was the lack of consistency in the absolute differences that were obtained. On both the behavioral interaction and total racial isolation indices, the Control group yielded the least positive changes of any treatment group. Beyond that, there is little consistency in the group differences. For example, the Peer Reinforcement group made the greatest gains on behavioral interaction, but ranked fourth on total racial isolation changes. In contrast, the Group Process *S*s ranked first on sociometric changes and fourth on behavioral interaction changes.

One explanation for these differences in treatment effects is that the Peer Reinforcement program focused on positive behavioral interaction between isolates and members of the other race and the Group Process experience emphasized discussion of feelings about members of the other race. The latter approach would be more likely to produce changes in feelings and the former changes in behavior. In the current study, the confidential sociometric responses most likely provided the most sensitive measure of covert feelings, and assessment of biracial interaction provided a direct measure of behavior.

There are several factors which may have militated against more positive results in the study. One is a satiation effect. It is the feeling of the *E*s that the highest point of biracial interaction would probably have been obtained near the midpoint of treatment applications. Observational data on the independent variables indicated that most treatments were being most effectively applied at that time. Some *S*s appeared to have had an overdose of biracial interaction by the end of the treatments.

Another variable which had an undetermined effect on the study was the generally tense relationship between blacks and whites in the city in which the study was conducted. One major high school in the city had been closed several times because of race riots, and racial problems in the city had received extensive attention in the local news media. Racial tension in the city finally resulted in a school-wide racial confrontation near the end of the treatment period. The confrontation produced immediate and complete polarization between black and white students. Although a major riot was averted, police occupied the building for more than a week and many white students did not return to school for several days. Some students dropped from school after the confrontation. For example, a white student in the Teacher Reinforcement group who had established significant rapport with several black isolates transferred to another school the week following the confrontation.

A factor which undoubtedly limited the effectiveness of the Peer Reinforcement and Role Modeling treatments was the dearth of potent reinforcers and role models in the respective classes. Only two of the six peer reinforcers consistently exhibited appropriate behavior toward isolates of the opposite race. In the Role Modeling treatment only two models, one black and one white, appeared to have any degree of popularity among members of the opposite race. Although most of the isolates were males, only two of the role models were males.

The effectiveness of treatments, such as those applied in the present study, is markedly delimited by a multitude of variables in the school, community, and society which militate against interracial harmony. For example, in the Role Modeling treatment the same models who dispensed reinforcement within triad sessions consistently failed to instigate cooperative behavior between themselves and the isolates outside the triad. In many cases, cooperative behaviors between the models and the isolates were not only ignored, but were punished by other members of the experimental class. One must admit that the generalizability of treatments like those in the present study will be severely limited without a concomitant increase in reinforcement for interracial cooperation in the environment outside the immediate treatment settings.

E. SUMMARY

The study appraised the effects of five treatment conditions, contingent teacher reinforcement, peer reinforcement, role modeling, group process, and control, on two major dimensions of interracial harmony, biracial sociometric measures, and biracial behavioral interaction. Sixty racial isolates in five racially balanced classes of a metropolitan junior high school served as *S*s. A main effect positive change was obtained on both the sociometric and behavioral measures. Differences between groups in amount of change were statistically nonsignificant. However, the raw data indicated that the control group made the least improvement of any treatment group.

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Genetic Psychology Monographs (*continued*)

VOLUME 69—January-June, 1964

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VOLUME 70—July-December, 1964

ructure and function—H. Gutman
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VOLUME 71—January-June, 1965

uthor index for Genetic Psychology Monographs 1926-1964—L. W. Ferguson
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VOLUME 72—July-December, 1965

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VOLUME 74—July-December, 1966

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VOLUME 77—January-June, 1968

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Genetic Psychology Monographs *(continued)*

VOLUME 78—July-December, 1968

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MARCH, 1971

(Manuscripts are printed in the order of final acceptance)

Studies of astrology 141
By Bernie I. Silverman

Factors in the verbal and motor learning of imbeciles 151
By Ihsan Al-Issa

Schizophrenia: A new research design to study its causes and a new theory . 157
By Roy Dreistadt

The relationship between performance in a graduate course in statistics and the Miller Analogies Test and the Watson-Glaser Critical Thinking Appraisal 165
By Earl W. Kooker

Correlation of WISC with motor speed and strength for brain-damaged and normal children 169
By Thomas J. Boll

(OVER)

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The psychological evaluation of profoundly retarded children with the use of concrete reinforcers 173
By J. Husted, K. Wallin, and H. Wooden

Measuring single-letter cue selection in paired-associate learning: A methodological note 181
By Franklin M. Berry and Alfred A. Baumeister

Sensory deprivation *vs.* sensory stimulation during early development: A comment on Berkowitz's study 189
By James W. Prescott

Assessing aggressive and friendly behaviors in young children 193
By Ruediger S. Schroeer and Dorothy Flapan

Correlation between the immediate test and the Wechsler Adult Intelligence Scale verbal scale in the rehabilitation setting 203
By John G. Cull and Richard E. Hardy

Reflections on the categorization of human excellence 207
By Joav Gozali and Jack Sloan

Note on the relationship of ordinal position, dogmatism, and personal sexual attitudes 213
By Blair Swanson

Prejudice and adjustment to cultural norms among English-speaking South Africans 217
By Christopher Orpen

Effect of knowledge of objectives on visualized instruction 219
By Francis M. Dwyer

Divergent thinking, remote associations, and concept attainment strategies . 223
By Victor K. Phillips and E. Paul Torrance

Changes in sexual identification and role over a decade and their implications 229
By Fred Brown

College students' performance on the "fruit-tree experiment" under varied conditions of color availability 253
By Georgelle Thomas and Shirley W. Osgood

The use of covert reinforcement in the modification of attitudes toward the mentally retarded 257
By Joseph R. Cautela, Kenneth J. Walsh, and Peter A. Wish

Measurements of acceptance, allowing self-direction, involvement and empathy in adult-child interaction 261
By Lillian Stover, Bernard G. Guerney, Jr., and Mary O'Connell

The effects of T-group training on business game results 271
By E. T. Hellebrandt and John E. Stinson

Group risk taking and constituency power 273
By John J. Hartnett

Published as a separate and in *The Journal of Psychology,* 1971, 77, 141-149.

STUDIES OF ASTROLOGY*[1]

Department of Psychology, Michigan State University

BERNIE I. SILVERMAN

A. INTRODUCTION

Astrology, perhaps the most popular of personality theories, has generated the least empirical research, no doubt because it lacks sanction as scientific inquiry. Ironically, the scientific community's neglect of astrology has allowed it to prosper by effectively rendering it immune to falsification. Consequently, skeptics, as well as believers, must resort to their own preconceptions and those of like-minded "authorities" when attempting to ascertain the validity of astrology.

The principal tenet of astrology is that the individual's personality is greatly influenced at the moment of birth by the position of the sun, moon, and planets within the zodiac, an area of the sky 16° wide that extends around the earth roughly parallel to the equator. Astrologers have divided the zodiac into 12 equal portions, each corresponding to a particular sign. The position of the sun alone, at the instant of birth, determines the individual's sign. For example, all persons born while the sun is traversing that area of the zodiac labeled Sagittarius are Sagittarians. As the sun is considered the most important force influencing personality (3, p. 73), the individual's sun sign is considered the best single predictor of personality, as well as various behaviors that are theoretically personality contingent.

The few studies that have focused on astrology's validity generally fail to support the contentions of astrologers. Gauquelin (2) found, contrary to the predictions of astrology, that (*a*) those born under the sign Aries are no more likely to become soldiers than others, and (*b*) those born under the sign of Libra occur no more frequently than would be expected by chance among the ranks of artists and musicians.

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[1] Thanks are first due Mr. Arthur Taylor of the Michigan Public Health Department who graciously provided access to the marriage and divorce records of Michigan. Samples used in the second investigation were drawn by Diane Young, Sue Dinerstein, Michele Naifeh, Cathi Smith, Steve Atkinson, Tom Sams, and John Adams. Dan Gutkin supplied much appreciated help with the data analysis, while Ron Michelini and George Bishop aided in formulating the third study. Finally, I am grateful to Nancy Hammond, Raymond Cochrane, and Frank Holly for their suggestions concerning previous versions of this manuscript.

The first two studies reported herein set out to determine whether astrology is valid. If the answer should be negative, a second equally interesting question arises: namely, why do so many persons seem to believe that astrology renders accurate personality descriptions? The third study attempts a partial answer of this intriguing paradox.

B. STUDY I

1. *Hypotheses*

This investigation employed the Rokeach Value Survey (7), a direct reflection of personality, to determine whether personalities differ according to the 12 signs of the zodiac as astrologers predict. An analysis of several astrology books yielded the hypotheses tested: (*a*) those born under the signs Libra and Aquarius rank the value EQUALITY higher than the combination of those born under the remaining 10 signs; (*b*) those born under Sagittarius rank the value HONEST higher than the combination of those born under the remaining signs; (*c*) those born under the signs Pisces and Aquarius rank the value HELPFUL higher than the combination of those born under the remaining signs; (*d*) natives of Taurus and Cancer rank the value FAMILY SECURITY higher than the combination of those born under the other signs; (*e*) the combination of those born under the signs Virgo, Gemini, and Capricorn rank the value INTELLECTUAL higher than the combination of those born under the remaining signs.

2. *Method*

A systematic sample of 1600 psychology graduate students was drawn from a sampling frame of 8000 such students, with the use of a 1/5 sampling fraction. The sampling frame was constructed from mailing lists supplied by 97 universities. Questionnaires, which in part consisted of the Rokeach Value Survey, were sent to each student, and subsequently 954 were returned, yielding a response rate of 59%. The value survey required the subject to rank two sets of 18 values each in order of their importance as guiding principles in the subject's life. Subjects' zodiac signs were determined from the day and month of birth as written on the questionnaires.

To determine those values that ought to be important to natives of particular signs four astrology books (3, 5, 6, 9) that supplied detailed personality descriptions corresponding to each sign were content analyzed for values. A value or its synonyms, as interpreted in the value survey, had to be explicitly mentioned in the personality sketch of a sign in order for it to be recorded as typical of that sign. Further, important values for individuals born under particular signs were considered to be those mentioned in at least three of the four books.

3. *Results*

First the median rank of each value for the total sample was determined. Subjects were then categorized as being at or above or below the median on each value. The χ^2 statistic was then used to discover if there was a significant relationship between subjects' sun signs and their value rankings. Cell frequencies were inspected to find out if the direction of the obtained relationships was as hypothesized.

Of those subjects born under the signs Libra and Aquarius, 70 ranked EQUALITY at or above the median, while 64 ranked it below. Corresponding figures for subjects born under the remaining 10 signs were 414 and 371. These frequencies yield a χ^2 value of .04 indicating those born under the signs Libra and Aquarius consider EQUALITY no more important as a guiding principle in their lives than others.

Among Sagittarians, 46 ranked HONEST at or above the median, while 40 ranked it below. Among subjects born under the other signs the comparable figures were 463 and 363. A χ^2 of .20 resulted, indicating that those born under the sign Sagittarius see HONEST no more central to their personality than others.

Of those subjects born under the signs Pisces and Aquarius, 71 ranked HELPFUL at or above the median, while 56 ranked it below. Corresponding figures for subjects born under the remaining signs were 417 and 369. These frequencies yield a χ^2 value of .35, indicating those born under the signs Pisces and Aquarius do not differ from others in the importance they attribute to being HELPFUL.

Of those born under the signs Taurus and Cancer, 81 ranked FAMILY SECURITY at or above the median, while 72 ranked it below. For subjects born under the remaining signs the corresponding figures were 409 and 358. These frequencies yield a χ^2 value of .03 indicating those born under the signs Taurus and Cancer do not consider FAMILY SECURITY any more important than subjects born under other signs.

Among subjects born under the signs Virgo, Gemini, and Capricorn, 130 ranked INTELLECTUAL at or above the median, while 126 ranked it below. Among subjects born under the other signs the comparable figures were 358 and 298. A χ^2 of 1.06 resulted, indicating that those born under Virgo, Gemini, and Capricorn view the value INTELLECTUAL as no more central to their personality than natives of other signs.

C. STUDY II

1. *Hypotheses*

Marriage and divorce are behaviors contingent to some extent upon the personalities of the partners. For this reason many astrologers deem particular pairs of signs compatible and suggest that those born under them should be especially attracted to one another and hence marry more frequently and divorce less frequently than would be expected by chance. Similarly, astrologers designate other pairs of signs incompatible and imply that natives of these signs should marry less frequently and divorce more frequently than would be expected by chance. Therefore, the hypotheses tested were (*a*) those born under compatible signs marry more frequently and (*b*) divorce less frequently than would be expected by chance, while (*c*) those born under incompatible signs marry less frequently and (*d*) divorce more frequently than would be expected by chance.

2. *Method*

Two systematic samples of 1586 and 1392 marriages were drawn, with the use of a 1/50 sampling fraction, from sampling frames consisting of marriages in Michigan during 1967 and 1968 respectively. Thus two independent tests of the marriage hypotheses could be made. A nonprobability sample of 478 divorces granted in 1968 was acquired for a single Michigan county. Statistical independence having been assumed, it was possible to calculate the expected proportion of every possible combination of signs for each sample. The obtained proportion of each combination of signs was directly calculated from the samples.

Explicit predictions made by two astrologers (4, 9) were used to designate combinations as compatible or incompatible.[2] Both judged 12 pairs of signs as especially compatible, but one listed 18 incompatible combinations, while the other gave 12. As there was not complete agreement between astrologers, the predictions of each were tested separately.

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[2] Lyndoe's compatible pairs were Aries-Leo, Aries-Sagittarius, Taurus-Virgo, Taurus-Capricorn, Gemini-Libra, Gemini-Aquarius, Cancer-Scorpio, Cancer-Pisces, Leo-Sagittarius, Virgo-Capricorn, Libra-Aquarius, and Scorpio-Pisces. Compatible or attracted pairs according to Wagner were Aries-Gemini, Aries-Aquarius, Taurus-Cancer, Taurus-Pisces, Gemini-Leo, Cancer-Virgo, Leo-Libra, Virgo-Scorpio, Libra-Sagittarius, Scorpio-Capricorn, Sagittarius-Aquarius, and Capricorn-Pisces.

Lyndoe's incompatible or unattracted pairs were Aries-Cancer, Aries-Libra, Aries-Capricorn, Taurus-Leo, Taurus-Scorpio, Taurus-Aquarius, Libra-Capricorn, Gemini-Virgo, Gemini-Sagittarius, Gemini-Pisces, Cancer-Libra, Cancer-Capricorn, Leo-Scorpio, Leo-Aquarius, Virgo-Sagittarius, Virgo-Pisces, Scorpio-Aquarius, Sagit- tarius-Pisces. For Wagner unattached pairs were Aries-Cancer, Aries-Capricorn, Taurus-Leo, Taurus-Aquarius, Gemini-Virgo, Gemini-Pisces, Cancer-Libra, Leo-Scorpio, Virgo-Sagittarius, Libra-Capricorn, Scorpio-Aquarius, Sagittarius-Pisces.

Table 1 displays findings concerning interpersonal attraction as manifest in marriage and divorce. The hypotheses were tested on obtained and expected proportions based on observations (marriages or divorces) garnered from combinations of 12 or 18 pairs of compatible or incompatible signs. The table is arranged so that if the findings support the astrologers' predictions, obtained proportions (P_o) will exceed expected proportions (P_e) in the first three rows, while expected proportions will exceed obtained in the bottom three rows. To test for differences between expected and obtained proportions, a *t* test between proportions was used. Inspection of Table 1 reveals that obtained proportions did not deviate significantly from expected proportions in any case, suggesting that marriage and divorce are independent of couples' sun signs. Consequently the four hypotheses are rejected.

4. *Conclusion*

The first investigation suggests that the *position of the sun in the zodiac at birth does not affect later personality,* at least as measured in terms of values. The results of the second study reinforce this contention if two assumptions are valid: namely, (*a*) personality contributes to attraction and (*b*) attraction or its absence may be validly operationalized as marriage and divorce.

Note that the large samples used in the second investigation insure that even the slightest effect of the sun on interpersonal attraction would have been detected as statistically significant were it in fact there. In short the findings of the first two studies compel one to conclude that *astrology is invalid.*

D. STUDY III

1. *Introduction*

Given that personality descriptions provided by astrologers are false, why do so many persons feel there is some truth to them? The descriptions are no doubt easy to accept, as they are, for the most part, quite flattering. Yet all are more or less equally favorable and therefore this factor alone cannot explain peoples' tendency to see the description corresponding to their own sign as relatively self-descriptive.

Perhaps a clue to the way in which personality descriptions based on astrology achieve apparent validity can be found in membership group theory. Siegal and Siegal (8, p. 363) have shown "the imposition of a membership group does have some effect on an individual's attitudes, even when the imposed group is not accepted by the individual as his reference group." Charters and Newcomb (1) found that making a membership group salient resulted in subjects' attitudes changing toward the membership group's norms.

TABLE 1
OBTAINED AND EXPECTED FREQUENCIES OF MARRIAGES AND DIVORCES BETWEEN COUPLES DEFINED AS COMPATIBLE BY ASTROLOGERS

	Edward Wagner					Edward Lyndon				
Variable	No. of pairs of signs	No. of obser-vations	P_e	P_o	Sig.	No. of pairs of signs	No. of obser-vations	P_e	P_o	Sig.
Compatible marriages, 1967	12	260	.163	.163	—	12	280	.163	.176	—
Compatible marriages, 1968	12	265	.163	.189	—	12	252	.163	.180	—
Incompatible divorces, 1968	12	87	.163	.182	—	18	128	.244	.267	—
Incompatible marriages, 1967	12	267	.163	.168	—	18	412	.245	.259	—
Incompatible marriages, 1968	12	232	.163	.166	—	18	347	.244	.249	—
Compatible divorces, 1968	12	76	.163	.158	—	12	82	.163	.171	—

It may be that self-perception or, in other words, attitudes about oneself, like those about external objects, are influenced by membership group salience. In this context we can't posit that sun signs define membership groups. The norms of these groups, regarding personality characteristics, are explicitly spelled out by astrologers in their personality descriptions of those born under the 12 signs. If personality descriptions based on astrology seem valid because they are construed as defining the normative personality of a membership group, making astrological affiliation salient should increase the proportion of persons who view their astrological personality description as a relatively accurate description of themselves. This was the hypothesis tested.

2. *Method*

One hundred and eleven students enrolled in an introductory psychology course were assigned to one of two groups. All subjects were given questionnaires consisting of 12 single paragraph personality descriptions (copied from astrology books), one for each sign of the zodiac. Each description given to those in the group in which astrological affiliation was salient ($N = 51$) was headed by the appropriate sign, as well as the birthdays it included. Subjects in this group were asked to write their own sign on the cover of the questionnaire before reading the descriptions within and indicating which four came closest to describing them. Subjects in this group, then, were aware both of their sun signs and the appropriate personality description according to astrology.

For those in the group in which astrological affiliation was not made salient ($N = 60$) the personality descriptions were titled simply Type I, Type II . . . Type XII. These subjects were told that the personality descriptions came from Morris' *Twelve Ways of Life* and, like the first group, were asked to choose the four that best described them. The sun signs of those in this group were obtained on a questionnaire administered later in the experiment. Presumably subjects in this group were not thinking of themselves in terms of astrology while completing the questionnaire containing the personality descriptions.

3. *Results and Discussion*

Twenty-six of the 51 subjects ($p_1 = .51$) in the group in which astrological affiliation was made salient saw the personality description corresponding to their own sign as one of the four that best described them. Comparable figures for the group in which astrological affiliation was not emphasized were 18 out of 60 ($p_2 = .30$). A test between sample proportions yielded a $t = 2.33$ ($df = 109$, $p < .025$) and suggests that emphasizing astrological affiliation is positively related to subjects' choosing as relatively self-descriptive the personality description corresponding to their own sign. Interpreting these choices as meaning subjects actually see themselves more like the descriptions they selected than those they did not, leads to the conclusion that making salient astrological affiliation results in persons seeing themselves as relatively accurately described by astrology based personality descriptions. Thus the hypothesis was supported.

The astrology salient condition corresponds to the way astrological predictions and personality descriptions are commonly presented. That more persons than would be expected by chance in such circumstances choose as self-descriptive the personality description corresponding to their sign confirms what previously was inferred only from astrology's great popularity. A surprisingly large number of people see astrology as rendering at least partially accurate personality descriptions.

But when astrology was not emphasized the proportion of persons who saw themselves as relatively accurately described by astrology did not deviate from chance. This finding, along with the results of the first two studies, suggests that the accuracy of astrology based personality descriptions is more apparent than real. Further the results of the third study imply that membership group saliency may be one of the variables contributing to persons seeing themselves as astrology predicts.

E. SUMMARY

Three investigations point to the same conclusion: namely, that the position of the sun at birth is not a valid predictor of an individual's personality. This was inferred from (*a*) subjects' failure to respond to the Rokeach Value Survey in a manner congruent with astrological predictions; (*b*) the failure of subjects to be attracted to one another, as evidenced in the behaviors of marriage and divorce, in accord with astrological predictions; (*c*) subjects not choosing the personality description corresponding to their own sign as best describing them when astrological affiliation was not made salient.

Subjects for whom astrological affiliation was made salient chose the personality description corresponding to their sign as a relatively accurate self-description more often than would be expected by chance. This finding was interpreted as indicating the variable of membership group saliency underlies astrology's ability to render apparently accurate personality descriptions.

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FACTORS IN THE VERBAL AND MOTOR LEARNING OF IMBECILES*[1]

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A. INTRODUCTION

In recent years, there has been an increasing interest in the remedial training of mentally retarded children and adults. The efficiency of their training is dependent to a large extent on their ability to learn new skills. Although the learning abilities of the retarded are impaired, factors, such as age, practice, complexity, and difficulty of the task, may facilitate or hinder their performance (2, 5). Clarke and Blakemore (1) found that the benefits of training on a simple task (transfer of training) is negatively associated with age in groups of institutionalized imbeciles. This finding has been replicated with a more complex task (3). The present study was designed to investigate the effects of age and practice on motor and verbal performance of different groups of imbeciles. However, it is predicted in this study that when imbeciles continue having training in an institution with increase in age, practice would be more beneficial at an older age level.

B. METHOD

1. *Subjects*

Four groups had taken part in the verbal experiment. These groups differed as regards age and experimental conditions. The mean and standard deviation of age and *IQ* of the four groups are presented in Table 1.

In the motor experiment, there were six groups. The groups varied in terms of age and experimental conditions. The mean and standard deviation of the age and *IQ* of these groups are reported in Table 2. The young groups were from the Christine Meikle School for the mentally retarded; and the old groups were from an Industrial Training Centre in Calgary. The purpose of the Industrial Training Centre is to give further training for the school

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TABLE 1
MEAN AND STANDARD DEVIATION OF THE AGE AND *IQ* OF THE GROUPS USED IN THE MOTOR TASK

	Condition I (one trial)		Condition II (10 trials)	
Variables	Young ($N=20$)	Old ($N=20$)	Young ($N=20$)	Old ($N=20$)
Mean Age	8.93	20.06	9.12	20.93
SD Age	1.43	1.73	1.50	3.12
Mean *IQ*	48.43	46.50	50.12	44.00
SD IQ	6.44	6.74	5.59	8.82

TABLE 2
MEAN AND STANDARD DEVIATION OF THE AGE AND *IQ* OF THE GROUPS USED IN THE MOTOR TASK

	Condition I		Condition II		Condition III	
Variables	Young ($N=7$)	Old ($N=8$)	Young ($N=10$)	Old ($N=8$)	Young ($N=7$)	Old ($N=7$)
Mean Age	9.42	20.62	9.1	20.25	9.14	19.85
SD Age	1.27	2.50	1.66	1.90	1.67	2.19
Mean *IQ*	49.00	47.12	50.1	43.75	45.85	44.42
SD IQ	4.93	8.67	4.40	7.40	9.87	6.80

population. Boys and girls who reach a certain level of training in the school are usually transferred to the Industrial Training Centre.

2. *Tasks and Procedure*

a. Motor task. In the test room, a line was drawn across the floor and a block of wood (3-½" × 3-½" × 1-½") was placed 6′ from the line. Subjects were asked to obtain the block of wood which was on the other side of the line. They were given a stick to help them to obtain the wood object, but told not to cross the line. However, the stick was too short to enable them to obtain the object. They had to attach it to another stick which was lying nearby. If they were unable to solve the problem, the experimenter would demonstrate the task and ask them to do it again. (All *S*s that were included in this study were unable to carry out this task on the first trial.) This was called Condition I of the experiment. In Condition II the experimenter asked *S*s to watch him carrying out another task. In a corner of the same test room, there was a table with a line drawn across it. *E* tried to obtain a block of wood (1-¾" × 1-¾" × 1-¾") placed 18" from the line. *E* used a stick (12") to obtain the object, but his fingers and hands were not supposed to cross the line. Here again, the stick was too short to enable *E* to obtain the object. After a few attempts, *E* attached another stick (12″) to it and consequently was able to obtain the object. *S*s were asked to do the same demonstration task before being asked to try the original task again.

Condition III of the experiment was the same as Condition II except that the *S* was not asked to carry out the second demonstration task. In this condition, the purpose was to find out whether by only watching *E* carrying out the demonstration task *S* would be able to solve the problem in the original task: i.e., by attaching one stick to the other to make it long enough to obtain the wooden block. If *S* failed to carry out this original task successfully after the first demonstration, he was given five demonstrations on the second task.

Under all conditions, the time allowed for subjects in each trial was five minutes.

b. Verbal task. The verbal task consisted of two lists of simple words. Each word in list 1 had its counterpart in the other list (list 2); that is, both words belonged to the same category. The words in list 1 and list 2 (in brackets) were as follows: apple (banana), eye (hand), five (two), father (mother), white (red), Calgary (Edmonton), horse (cow), dollar (cent), shirt (jacket), steak (fried eggs).

*S*s were first asked to define words in list 1. If they were unable to give an abstract definition to any of the words in the list, they were told the correct abstract definition. Then *S*s were asked to define words in list 2. The purpose was to see whether by telling *S* the abstract definition of a word in list 1, he would be able to give the same abstract definition to a word in list 2 that fell in the same category. This was called Condition I in this experiment. Here *S*s were given only one trial on list 1. In Condition II *S*s were given 10 trials for learning the abstract definition of words in list 1. After being given list 1, subjects in both Condition I and Condition II were asked to define words in list 2. It was predicted that subjects in Condition II would give more abstract definitions than those in Condition I. Furthermore, groups that were given 10 trials on list 1 would show improvement in their performance on this list when compared with the performance of the one-trial groups. In all conditions, old subjects were predicted to perform better than young subjects.

c. Scoring. On the motor task, responses of subjects in each group were categorized into two classes: pass and fail subjects.

On the verbal task, the definitions of the subjects were classified into three categories (*a*) concrete or descriptive definition—implies that memory of an object at the concrete and sensory level [e.g., apple; red (score = 0)]; (*b*) functional or usage—recalling the use to which the object was put in the past [e.g., apple; to eat (score = 1)]; (*c*) categorical or abstract—involving an abstract attitude [e.g., apple; fruit (score = 2)]. This scoring method was taken from Gerstein (4).

C. RESULTS

1. *Motor Task*

Chi squares were calculated for the "pass" and "fail" subjects of the two age groups (old and young) in each of the three experimental conditions of the motor task. These chi squares were nonsignificant, which indicates that age was not an important factor in differentiating our subjects under the three experimental conditions. However, when the performances of the young groups and the old groups were examined separately under the three experimental conditions, it was found that the number of failures seemed to increase significantly from Condition I to Condition III (for young groups, chi square = 7.76, $p = .05$, $df = 2$; for old groups, chi square = 6.206, $p = .05$, $df = 2$).

2. *Verbal Task*

On the verbal task, the scores of all subjects on the first trial were calculated. Verbal scores on the tenth trial were also calculated for the groups who had extra 10 trials on list 1 (Condition II). Since we expected improvement in the subject's performance on list 2, after their experience with list 1, the scores of all subjects on the first trial on list 1 were subtracted from their scores on list 2. The data of the verbal performance of all groups are presented in Table 3 and Table 4.

TABLE 3
MEAN AND STANDARD DEVIATION OF VERBAL SCORES ON LIST 1 OF DIFFERENT AGE GROUPS UNDER EXPERIMENTAL CONDITIONS

Variables	Condition I (Scores on 1st trial) Young	Old	Condition II (Scores on 10th trial) Young	Old
Mean	2.00	10.44	2.62	9.00
SD	1.84	5.29	2.85	4.70

TABLE 4
MEAN AND STANDARD DEVIATION OF VERBAL SCORES OF LIST II MINUS SCORES ON 1ST TRIAL OF LIST 1 OF DIFFERENT AGE GROUPS UNDER DIFFERENT EXPERIMENTAL CONDITIONS

Variables	Condition I (One Trial) Young	Old	Condition II (10 Trials) Young	Old
Mean	.50	2.38	1.75	4.31
SD	2.21	3.04	2.59	3.64

The analysis of variance of verbal scores on list 1, Condition I (one trial) and Condition II (10 trials) is presented in Table 5. It is clear from Table 5 that although Condition II did not significantly affect the performance of the subjects on list 1, age seemed to be a significant factor in their performance. That is, the old group gave significantly more abstract definition than the young ones ($F = 55.63$, $p = .001$).

TABLE 5
ANALYSIS OF VARIANCE OF THE VERBAL SCORES OF THE EXPERIMENTAL GROUPS UNDER CONDITION I (ONE TRIAL) AND CONDITION II (10 TRIALS) ON LIST 1

Source	*df*	*SS*	*MS*	*F*
Condition I *vs.* Condition II	1	11.56	11.56	0.715
Young *vs.* Old	1	899.00	899.00	55.631***
Interaction	1	21.25	21.25	1.315
Error	60	970.02		

*** Significant at .001 level.

Table 6 shows that both age and number of trials on list 1 significantly affected performance on list 2. Subjects who were given 10 trials on list 1 showed better performance on list 2 than subjects who were given only one trial on list 1 ($F = 4.215$, $p = .05$). Moreover, old subjects showed better improvement than young subjects on list 2 ($F = 8.129$, $p = .01$).

TABLE 6
ANALYSIS OF VARIANCE OF THE IMPROVEMENT SCORES OF THE GROUPS ON LIST 2 (SCORE ON FIRST TRIAL ON LIST 1 SUBTRACTED FROM SCORE ON LIST 2) UNDER DIFFERENT EXPERIMENTAL CONDITIONS OF LEARNING LIST 1

Source	*df*	*SS*	*MS*	*F*
Condition I *vs.* Condition II	1	40.84	40.84	4.215*
Young *vs.* Old	1	78.77	78.77	8.129**
Interaction	1	1.89	1.89	.195
Error	60	544.18		

* Significant at .05 level.
** Significant at .01 level.

D. SUMMARY AND CONCLUSIONS

It is generally recognized that the mentally retarded are limited in their learning abilities and that their learning deficit is more apparent in tasks requiring a high level of abstraction, such as verbal skills (2, 5). However, the present study shows that despite the limits put by their basic potential, certain conditions and experiences are conducive to better learning among groups of imbeciles. In the motor task used in this study, it is clear that when retarded subjects fail to carry out a simple task and they observe it carried out by the experimenter they tend to benefit from this experience. Indeed, all our subjects were able to imitate correctly the experimenter on the motor task. On the other hand, when other groups of mentally retarded subjects were given the opportunity to observe the experimenter carrying out a miniature task which was similar to the original task in almost all respects, a large number of them did not benefit from this experience in solving the original problem. However, when they carried out the miniature task after observing the experimenter this resulted in improvement of their performance on the original task (Task 1). Observing, as well as "doing," appears to be needed for the training of the mentally retarded, under certain learning conditions. This seems to be applicable to young and old groups.

Although age did not differentiate subjects on the motor task, it appeared to be an important factor in the abstract definition of simple words. Old subjects gave more abstract definitions and generalized more from words in list 1 to words in list 2 than young subjects. This result is opposite to the ones reported by Clarke and his associates (1, 3), but these authors used discrimination sorting tasks. It is possible that with age there is an increase in the vocabulary of subjects and the test used in the present study was easier for old subjects. Regardless of the age of the subject, having more learning experience with list 1 enabled the subjects to generalize the same concepts to list 2 and thus to show improved performance on the latter.

In general, the present study shows that imbeciles from different age groups are able to learn simple motor and verbal tasks and to benefit from this experience in learning other related material.

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SCHIZOPHRENIA: A NEW RESEARCH DESIGN TO STUDY ITS CAUSES AND A NEW THEORY*

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A. Introduction

One of the major types of research to determine the causes of schizophrenia has been done with data from twins. Kallmann (11) found that among identical or monozygotic twins, one of whom is schizophrenic, there is an 86.2 percent probability of the other twin developing schizophrenia. The percent was slightly lower for identical twins who were separated than for those who were not (77.6 to 91.5 percent), although most of the separated identical twins in his sample had been separated long after they reached maturity. In the case of fraternal or dizygotic twins, Kallmann found only a 16.4 percent probability. Kallmann regarded the results of his study as evidence for a genetic etiology of schizophrenia, but parental rearing and home environment could also explain the results of his twin studies and of his other studies as well. That the other identical twin usually or often becomes schizophrenic if one twin develops the disorder can be explained by the fact that they tend to be reared alike (because they look alike and their parents know that they are identical twins). This means that if one twin becomes schizophrenic because of the way he is reared, the other is likely to become schizophrenic too. Fraternal twins are not anymore likely to be raised alike than other siblings.

Rosenthal (18) found that schizophrenia was virtually absent in the families of discordant twin pairs but occurred in approximately 60 percent of families of concordant twin pairs. He concluded that there are at least two broad groups of schizophrenia: one in which the genetic factor is absent or minimal and the other in which it is apparently substantial. Actually, since the twins grew up together, Rosenthal's study only seems to show that in the latter group of schizophrenics the family background may be more important as a causal factor but it does not indicate whether the cause is genetic or environmental.

Kringlen (13) re-examined Rosenthal's study and claimed that his data

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clearly do not support Rosenthal's conclusions. According to Kringlen, there are errors in Rosenthal's classification of discordant twins.

In another study, Tienari (20) found that in none of his 16 cases of schizophrenia was the other twin suffering from the disorder. He ascribed this discrepancy, to the fact that his twin data were taken from birth records, whereas in the other twin studies records of hospitalized patients were the source of the data.

Gottesman and Shields (7) did a study in England with a registry of twins. They found that when one identical twin had schizophrenia, there was a 42 percent probability of the other twin developing schizophrenia.

Kringlen (14) did a study in Norway with birth registers on the incidence of schizophrenia in identical twins and found 28 percent concordance.

These percentages vary somewhat, but since the identical twins in all these studies generally were not separated, these findings can be explained on the basis of genetics or environment or both genetics and environment.

Pollin and Stabenau (16) reported that in 12 pairs of identical twins, the twin who in later life became schizophrenic had weighed up to a pound less than his mate at birth. Family attitudes toward the weaker twin, according to these authors, may be the mechanism that could explain—in the absence of a genetic variable—the cause of schizophrenia in one twin and not in the other. Tienari (20) did not find that the twin who developed schizophrenia tended to be smaller at birth.

Bellak and Loeb (3, p. 8) state: "Endocrine or genetic or other factors may well play a role in *some* schizophrenics, but there is no evidence that they do in 'schizophrenia' nor . . . is it likely or logically plausible."

B. A NEW (IDENTICAL TWIN) RESEARCH DESIGN TO STUDY SCHIZOPHRENIA

Identical twins are usually reared almost the same way by their parents; and if identical twins separate or become separated from each other this is usually at the same time or after they have separated or become separated from their parents. It rarely, if ever, happens that one identical twin becomes separated from the other twin and from his parents while the other twin remains with the parents. These considerations enable one to conduct an orderly research in two parts.

1. In the first paradigm we determine whether the percent of cases in which the other identical twin develops schizophrenia, if one twin develops the disorder, is a function of the age that they separated (or were separated) from

their parents. Insofar as the percent of concordant cases of schizophrenia in nonseparated identical twins increases (and the percent of discordant cases decreases) as they are separated at a later and later age from their parents it indicates the increasing degree of cumulative influence of parental rearing in the etiology of schizophrenia. The percent of concordant cases of schizophrenia in identical twins that have been separated from their parents at birth (and especially also from each other) tends to tell us the degree that schizophrenia is caused by genetic factors. Insofar as the cause of schizophrenia is genetic, one identical twin should become schizophrenic if the other of the pair does even if they are separated from their parents and from each other already at birth. This percent should really be used as a baseline and be subtracted from each part of the above function or curve when interpreting the increasing degree that parental rearing effects are (or are not) involved in causing schizophrenia. Insofar as the percent of discordant cases of schizophrenia in identical twins increases (and percent concordant cases decreases) as identical twins separate or become separated at earlier and earlier ages from their parents, it tends to indicate that differential rearing of the twins by the parents (perhaps because one twin was weaker or had more illnesses) appears to be the cause of why one twin develops schizophrenia. This increased discordance is not likely to be due to later socioeconomic environmental factors, since these twins are not separated from each other and so tend to share the same later environment after they are living separately from their parents.

2. In the second paradigm we use the data of identical twins that separated or were separated from each other at about the same time that they separated from their parents, and determine whether the percent of cases in which the other twin develops schizophrenia, if one twin develops the disorder, is a function of the age that they separated (or were separated) from their parents. Insofar as the percent of discordant cases of schizophrenia in these identical twins that separated from each other at about the same time that they separated from their parents increases (and the percent of concordant cases decreases) beyond the function in the first paradigm (with nonseparated identical twins) as they are separated at an earlier and earlier age from their parents and from each other, it tends to indicate the degree that later socioeconomic environmental factors are involved in causing schizophrenia. This interpretation is based on the fact that these separated identical twins have different later social environments, but are otherwise comparable to the twins of the first paradigm that separated from their parents at the same respective ages but did not separate from each other.

C. THE PROBLEM OF THE NATURE OF THE GENETIC FACTOR IN SCHIZOPHRENIA

There is also the problem regarding the nature of the genetic factor (or factors) that seems to be at least to some degree involved in schizophrenia. Is it really a defective gene (or genes) that causes a person to develop schizophrenia; or are the "genetic factors" normal ones, such as being more sensitive, more imaginative, more emotional, more passive, more ectomorphic in body build, which make it easier for his parents and others to dominate and control his life (if they are so inclined because of their own frustrations and he cannot escape them), thereby tending to prevent him from developing and expressing his personality his own way toward self-actualization, while inwardly he feels frustrated and angry? In this case he would tend to break down eventually, and to withdraw himself from his environment (and from his relationships to other people) and regress, in order to undo his false-self and false superficial relationships to other people so that he can return gradually to reality and rebuild his personality in the way that truly expresses and actualizes himself.

The present theory is an attempt to extend self-actualization theory beyond its development by Allport (1) and Maslow (15).

There are many types of studies that can be interpreted to support this theory of the nature of schizophrenia. Karlsson (12, p. 9) states that genealogical research done in Iceland indicates that families with the most schizophrenics also had more creative persons. He goes on to say that the risk of developing schizophrenia "is increased in persons of unusually high intellect and creative ability or their relatives. . . . It certainly seems that members of families with schizophrenia are often prominent in political, social, or cultural leadership." It is possible to theorize that the schizophrenic members of these families also are creative but—since it is not easy to follow a creative life and profession, and to be allowed to earn a living at it—they tend already early in life to be derailed by their parents, teachers, and other people from developing their personalities their own way and therefore become schizophrenic.

There are also studies showing a correlation between low socioeconomic living and greater likelihood to develop schizophrenia. Hollingshead and Redlich (10) found that the incidence rate of schizophrenia for Class I and Class II was 6 per 100,000, while the incidence for Class V was 20 per 100,000. The prevalence figures were 111 and 895, respectively. Similarly, studies done in Iceland by Helgason (8) concerning the socioeconomic status of schizophrenics themselves, rather than of their families, also indicate that schizophrenics tend to arise more from lower socioeconomic classes.

It is argued that the socioeconomic conditions contribute to the development of schizophrenia; or that the person drifts down to a low socioeconomic level after he develops schizophrenia; or that his inadequacy that eventually causes him to develop schizophrenia also causes him to drift down to a low socioeconomic level before he develops the disorder and to drift down further after he develops it. No doubt, these hypotheses are all partially true. But, it certainly can be said that a person from a lower socioeconomic level has more difficulty in developing his personality and actualizing himself, especially if he is sensitive, imaginative, and creative. His parents, who live in poverty, often try to control him and lead him into following a simple practical life and occupation; his teachers, and other people in general, are all more likely to keep telling a person from a low socioeconomic class what to do, while they tend to encourage and even make it easy for a person of a high socioeconomic class to live his life the way he wants and to follow whatever profession he wishes.

Schooler (19) found that last born persons are more likely than firstborn persons to be hospitalized for schizophrenia, and that this is especially true for large families. Last born persons also do not have as good a probability of recovery. This can be explained in a like manner, as being due to the fact that a last born person—especially in a large family—has more older persons (parents and older siblings) around him who may dominate and control his behavior, so that he cannot adequately express and develop himself according to his own potentialities. There are more persons in a large family who can have a schizogenic influence on the younger member.

Rao (17) found that in India there is a preponderance of schizophrenic patients in the first and second sibling positions. In India the first and second born children must fulfill traditional family obligations and Rao asserts that socioeconomic stresses such as these may precipitate a schizophrenic breakdown. The present author would add, in line with his theory, that the stress involved here is due to the strong traditional family influences in India which make it difficult for first and second born individuals to follow life goals that are fulfilling and self-actualizing for them.

In a quite different study, Dennehy (4) found that a higher percentage of schizophrenic patients had lost a parent by death before the age of 16 than was the case among normal persons. The present author again theorizes that when the early death of a parent contributes to a person developing schizophrenia, it is not the death of the parent *per se* that is the causal factor, but in these cases the death of one parent makes it easier for the other parent (sometimes with the help of older siblings) to dominate and control the behavior of the child, thereby making it difficult for him to develop his personality in a self-actualizing manner. When an individual grows up with two parents, it is usually not so easy for one parent to dominate and control his life and behavior. Thus, having two parents is to some degree a protection against schizophrenia.

In a study by Garmezy, Clarke, and Stockner (6) schizophrenic patients were asked to reflect upon the time they were 13 or 14 years old and to respond to a 75-item child rearing scale as they thought would reflect the attitudes of their parents at that time. The schizophrenics perceived their parents as dominating, not overprotective or rejecting. This agrees with the present author's theory, but it is too general. It appears that all neuroses and psychoses are caused by consistent dominating on the part of a parent or parents, but that there are different ways of dominating that cause different emotional disorders. The finding of Dworin and Wyant (5) with the F-scale (authoritarianism) is more specifically congruent with the present author's theory of the cause of schizophrenia. Their finding is that the mothers of schizophrenics are "domineering and smothering, but also demanding of achievement."

The schizogenic (schizophrenia-causing) parent is theorized by the present author to be one who dominates, controls, and guides the behavior of the child—largely by excessively rewarding behavior that the parent wants the child to develop—and thereby interferes with the child's drive and efforts to develop his personality in a self-actualizing manner according to his identity.

In regard to the Bateson, Jackson, Haley, and Weakland (2) double-bind theory of schizophrenia, the present author theorizes that all forms of neuroses and psychoses (including schizophrenia) are caused by double-binds, but not by the same kind of double-binds. There are many types of double-binds and once we succeed in classifying them we will have a good conception of how each type of emotional illness is caused. The author is working on a classification of double-binds and relating them to emotional disorders. All double-binds occur because a young individual is dependent on his parents—and even an adult individual is still to some degree dependent (interdependent) on other members of society for rewards—and yet he has the need to develop himself in his own way in order to actualize himself. Thus, if significant others upon whom a person is to some degree dependent want to control and manipulate him to their own advantage, then he can only be rewarded by them by acting and developing in the way that they want him to act and develop. This interferes with his drive and efforts to develop his personality in a self-actualizing manner according to his identity.

Finally, there are also various biochemical physiological theories of schizophrenia. Hoffer and Osmond (9) hypothesized that schizophrenia results from pathological transmethylation of normal metabolites into psychotomimetic compounds. Specifically, they postulate two basic conditions for the development of schizophrenia: an increase in the concentration and activity of acetylcholine centrally and an abnormal diversion of adrenalin into some quinone indole. Thus, they hypothesize that schizophrenia is produced by a compound that inhibits acetylcholine esterase and causes an increased production of adrenalin that is converted into an indole, such as adrenochrome. In their experiments with compounds, especially adrenochrome, they reported that they were able to produce perceptual disturbances, disorders of judgment, withdrawal of interest, severe depression, and other changes characteristic of schizophrenia.

Biochemical theories like this are not necessarily incongruent with the present author's theory. It can be assumed that a person tends to develop his personality in a self-actualizing manner (which involves chemical processes and their development), and that this development is determined by his genetic constitution. It can further be assumed that the cumulative effects of experiences that tend to interfere in a specific manner with the self-actualizing development of an individual's personality also distort and transform his normal chemical compounds into pathological ones. There should be specific mechanisms for each type of emotional disorder. When a person develops a major emotional conflict because of the cumulative effect of specific experiences that interfere in a specific way with the development and expression of his personality, as occurs with double-bind experiences, the person represents the conflict by overdeveloping specific chemical processes and turning them against (inhibiting) some of his other chemical processes. The compromise chemical products produced correspond to the compromise of the conflict, which means that these compromise chemical products correspond to the symptoms of the disorder.

D. SUMMARY

This study briefly describes the findings of the major twin studies of schizophrenia that began with the classical research done by Kallmann. A new two-part research design (that would use data from identical twins) was outlined. Its purpose would be to disentangle genetic factors, childhood environmental factors, and later environmental factors in the etiology of schizophrenia. Finally, the nature of the possible genetic causes of schizophrenia was discussed and a self-actualization theory of schizophrenia was outlined. It

was shown that the findings of various kinds of psychological and sociological research tend to support a self-actualization theory of schizophrenia.

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THE RELATIONSHIP BETWEEN PERFORMANCE IN A GRADUATE COURSE IN STATISTICS AND THE MILLER ANALOGIES TEST AND THE WATSON-GLASER CRITICAL THINKING APPRAISAL*[1]

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A. INTRODUCTION

With increasing numbers of students seeking admission to graduate schools, there is a continuing need for refinement of selection procedures. Since facilities and staffs are limited, it is obviously desirable to admit those students for whom the probability of success is highest.

One instrument which is widely employed as a part of this selecton process is the Miller Analogies Test (MAT). However, examination of existing research does not, in general, reveal a very high relationship between performance on this test and performance in graduate school. This is especially true if grade point average is used as the criterion.

Correlational analyses have resulted in either nonsignificant or barely significant values in several studies (1, 2, 4, 8). The results have not been any more encouraging when successful and nonsuccessful students have been compared on the MAT (4, 5). Significant correlations have been reported for certain kinds of faculty ratings, such as ratings on potential scientific contribution (5) or intellectual capacity (9). However, for other ratings, nonsignificant results have been found: e.g., ratings on research capacity (2), capacity to achieve a Ph.D. (7), academic competence and job ratings (8), and research capacity or service potential (9).

Among the possible explanations suggested for these low relationships is the homogeneity of the groups with regard to the MAT. Such homogeneity results from the MAT having been employed in the process by which the subjects comprising the samples had been selected. The restricted variability in the criterion measure, essentially a three-point scale since grades less than C may

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be infrequently given, has also been offered as a causative factor for the low correlations.

In this study attempts were made to at least partially remedy these two conditions. The applications for admission to the doctoral program of all students in the sample had not been acted upon at the time the data were gathered, and thus the variability on the MAT would not have been as restricted. In addition, an achievement measure allowing for greater differentiation was employed. It was further felt that limiting the achievement measure to one area might provide more insight into the adequacy of the MAT as a predictor. For comparison purposes, another predictor which had not been used in the selection process of any of the students was also utilized.

B. METHOD

1. *Subjects*

The subjects were 69 students enrolled in four sections of a statistics course required of all doctoral candidates in the School of Education. However, though all had been admitted to the graduate school, some had not had their application for admission to candidacy acted upon but were enrolled in courses, pending action on their applications.

2. *Procedure*

The *Watson-Glaser Thinking Appraisal,* Form Am, was administered to the subjects in connection with the statistics course. This measure was included because it purports to measure a capacity which would seem to be relevant to the use and interpretation of statistics. The subjects were told the data were being gathered for research purposes. The *Miller Analogies Test* was administered through the University Counseling Center.

The criterion measure was derived from the student performance on three multiple choice tests, which were about equally spaced throughout the semester. Each test consisted of approximately 50 items. The criterion score was calculated by totaling the three scores, then dividing by the highest total in that class and changing this quotient into a percentage.

The four classes were all taught by the same instructor using the same text. Though the tests were not all exactly the same across classes, when a new test was constructed, the old items were used as models. The text employed was McNemar's (3). About two thirds of the textual content was covered.

C. RESULTS AND DISCUSSION

The means and standard deviations for the three variables are shown in Table 1. As had been anticipated, the variability on the MAT was somewhat larger than has been reported in other studies (4, 6, 9), and of course the var ability on the criterion measure was greater than for grade point averages an ratings utilized in other studies. However, in spite of these increases, the co relation between the MAT and the test scores was only .21 which was no significant. The correlation between the W-G and the test scores was .37 significant at the .01 level. The MAT and the W-G were correlated to th extent of .31, significant at the .05 level. When a multiple correlation wa calculated using the MAT and W-G as predictors, the result was .38 whic did not constitute a significant increase over the *r* between the W-G and the test scores ($F = .66$).

TABLE 1
MEANS AND STANDARD DEVIATIONS
FOR THE MAT, W-G, AND CRITERION TEST

Statistic	Variable		
	MAT	W-G	TEST
M	49.65	75.98	75.96
SD	11.78	9.61	10.24

The *r* obtained between the MAT and performance in a graduate course in statistics was consistent with those reported between the MAT and graduate performance in other studies. This was true even though there was greater heterogeneity with respect to the variables correlated. In addition, the MAT did not contribute significantly to a multiple *R* when used with the Watson-Glaser. The W-G does appear to offer some promise as a predictor. However, even though the obtained *r* between the W-G and test performance was significant at the .01 level, it accounted for only 14% of the variance in the test scores and thus leaves much to be desired fo ruse in making individual predictions.

D. SUMMARY

Examination scores in a graduate course in statistics were correlated with scores on the MAT and the W-G Critical Thinking Appraisal ($N = 69$). Since some of the subjects had not had their applications for admission to the doctoral program acted upon, it was anticipated that there would be greater variability on the MAT than is typical in such studies. However, a nonsignificant *r* of .21 was obtained between the MAT and test scores. The *SD* for the MAT was somewhat larger than has been reported in other studies. The *r* between the W-G and statistics test scores was .37 ($p = .01$). The MAT did not contribute significantly when added as a predictor to the W-G.

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CORRELATION OF WISC WITH MOTOR SPEED AND STRENGTH FOR BRAIN-DAMAGED AND NORMAL CHILDREN*[1, 2]

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THOMAS J. BOLL

A. INTRODUCTION

The Wechsler Intelligence Scale for Children provides a good deal more than just an *I.Q.* test. It allows the clinician to break down an individual patient's performance into scores on the various subtests and in so doing enables him to make comments about the various abilities measured by those subtests. The accuracy with which the WISC measures various aspects of human adaptive ability varies rather greatly. Few would argue that one's ability to use language is measured by the verbal subtests or that an element of motor-skill is required in order to perform adequately on the performance subtests. However, the terms "language" or "motor skills" cover a wide variety of activities and degrees of ability. Boll and Reitan (1), found that the degree of impairment among brain-damaged children as compared to controls depended upon the type of motor task utilized in the investigation. Tests of motor strength showed more deficits than did tests requiring motor speed which in turn appeared to be more sensitive to the effects of neurological impairment than did tests with a motor component in a problem solving context.

This investigation was designed to determine the correlation between performance on the Wechsler Intelligence Scale for Children and two tests of motor function: the Halstead Finger Oscillation Test and the Smedley Hand Dynamometer. The effectiveness of these two tests in contributing to the validity of a battery which is designed to differentiate neurologically impaired from normal patients is well documented (3) with adults, and (2) with children. Because of their proven effectiveness it was thought that these two tests had unique value in an attempt to assess the degree to which excellence of WISC performance is related to adequacy of motor functioning.

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[2] Statistical analysis for this study accomplished by Dr. Robert Fallis and James Hinkhouse, Research Office, Child Development and Mental Retardation Center.

B. METHOD

Subjects in the present study were 35 children aged 10 through 14 who met unequivocal neurological criteria for brain damage (see Table 1) and 35 normal subjects who were matched with the brain-damaged group on the variables of age and sex. Each subject was tested individually by a trained technician who was unaware of the purpose of this study or of the neurological diagnosis of any of the members of the brain-damaged group.

TABLE 1
DISTRIBUTION OF DIAGNOSTIC CATEGORIES FOR THE BRAIN-DAMAGED GROUP

Traumatic injury	12
Tumor	7
Congenital Vascular Anomaly	5
Inflammatory Damage	5
Perinatal Lesions	5
Abscess	1

The measure of motor speed was obtained by the Halstead Finger Oscillation Test. The subject is requested to tap with his forefinger as rapidly as he can for five ten-second trials. The average number of taps over these five trials is the individual's score. The subject taps first with forefinger of the dominant and then nondominant hand.

Strength was measured by the Smedley Hand Dynamometer. The subject is requested to squeeze the handle twice with each hand and the average amount of pressure applied is recorded in kilograms.

C. RESULTS

The results of this investigation, as shown in Table 2, indicate that the performance of normally functioning children on the motor subtests of the WISC has a very low correlation with performance on two tests designed specifically to test motor speed and strength. The one exception to this was the block design subtest. Excellence of performance on this subtest correlated significantly ($p < .01$) with excellence of performance on the two motor tests.

The Comprehension and Information subtests did correlate significantly with performance of both hands on the tests of finger tapping speed and strength of grip in the control group. Digit Span correlated .327 ($p < .05$) with tapping of the nondominant hand and .331 ($p < .05$) with strength of grip on the dominant hand.

The performance of the brain-damaged group on the performance subtests of the WISC failed to yield one significant correlation with two motor tests. Tapping speed of the dominant hand did correlate significantly with Verbal

TABLE 2
CORRELATIONS OF SCORES ON WISC SUBTESTS
WITH SCORES ON TWO TESTS OF MOTOR ADEQUACY

Subjects	VIQ	PIQ	FSIQ	INF	COMP	DSPAN	ARITH	SIM	VOC	PAPR	PCOMP	BDSN	OJ.ASS	DSYM
Control														
Tap														
D[1]	.09	—.16	—.04	.45**	.41*	.30	.20	.18	.22	.09	.14	.54**	.09	.20
ND[2]	.17	—.21	—.03	.48**	.47**	.33*	.24	.29	.28	.18	.16	.40**	—.10	.10
Brain damage														
Tap														
D	.44*	.18	.32	.39*	.27	.38*	.37*	.38*	.32	.11	.29	.08	.01	.32
ND	.25	.28	.26	.27	.20	.22	.04	.24	.36*	.26	.32	.21	.32	.20
Control														
Grip														
D	.15	—.11	.01	.38*	.53**	.33*	.21	.22	.26	.20	.26	.57*	—.01	.05
ND	.14	—.19	—.04	.39*	.51**	.28	.28	.22	.23	.13	.22	.46**	.01	.03
Brain damage														
Grip														
D	.30	—.10	.14	.43**	.21	.22	.45**	.31	.31	—.03	.21	.11	.01	.06
ND	.11	.07	.08	.28	.07	.11	.10	.23	.30	.08	.23	.23	.21	—.01

[1] Dominant hand.
[2] Nondominant hand.
* $p < .05$.
** $p < .01$.

I.Q. ($p < .01$), as well as with Information, Digit Span, Arithmetic, and Similarities subtests ($p < .05$). Performance on strength of grip test with dominant hand correlated significantly ($p < .01$) with Information and Arithmetic for the brain-damaged group.

D. Discussion

The results of this investigation do not encourage one to make statements about a subject's motor adequacy based on his scores on the performance items of the WISC. It is certainly premature to attempt any theoretical speculations as to the reason for the correlation between the measures of motor speed and strength and several WISC Verbal subtests. It does imply, however, that a battery of tests designed to tap specific aspects of human ability cannot be substituted for by one general ability measure without sacrificing significant amounts of potentially useful information.

E. Summary

An investigation using 35 normal and 35 brain-damaged children compared performance on the WISC to performance with each hand on the Halstead Finger Oscillation Test and the Smedley Hand Dynamometer. Correlations were low for both groups between the WISC performance subtests and the motor tests—with the exception of Block Design for the control group. Significant correlations between the motor tests and several WISC verbal subtests were found for each group.

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THE PSYCHOLOGICAL EVALUATION OF PROFOUNDLY RETARDED CHILDREN WITH THE USE OF CONCRETE REINFORCERS*

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A. INTRODUCTION

Tests attempting to measure the intelligence of infants have been in existence for four decades. Since the early 1930's, however, both the predictive validity and the overall usefulness of these experiments have been severely questioned. This lack of utility comprises a major problem to psychologists in attempting to accurately evaluate the profoundly retarded child. Cronbach (6), also has made definite statements, such as that the Cattell Infant Intelligence Scale (4), the most complex of the infant tests, has no predictive validity before the first birthday of the child. Cronbach gives two primary reasons to support his statement. The first is that the cerebral development of the infant below 12 months of age is such that tests have to rely on sensorimotor development which has little correlation to later more verbal mental abilities. The second, which is of more importance to this paper, is Cronbach's contention that tests for very young children are not reliable because of inconsistencies in the child's attentiveness, motivation, and alertness.

The reason for the general low esteem with which infant intelligence scales are held by authorities in the field of mental testing—e.g., Cronbach (6), and Anastasi (1)—is based primarily on comprehensive longitudinal studies conducted by Bayley (3), and Honzik *et al.* (9). Bayley, in order to investigate the cerebral development of infants, developed her own 185 item scale drawn primarily from intelligence tests already in use. After she had originally tested her subjects, all infants under two years of age, she examined them at frequent intervals up through the ages of six and seven when the Stanford Binet was given. The investigator then correlated scores of the 61 subjects from tests given in their infancy with test scores later in childhood. Correlations between these scores were insignificant. Dr. Bayley then concluded that "scores made before eighteen months are completely useless in the prediction of school-age abilities."

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In interpreting Bayley's results, two facts concerning her subject population and test employed should be mentioned. First, the test group was very atypical. The mean *IQ* on the Stanford-Binet of the children at nine years of age was 134, or more than two standard deviations above the average *IQ* score for children of that age. Second, her test itself was quite typical of tests now in use, including the Cattell Infant Intelligence Scale, containing many items testing physical or maturational processes.

Another similar study by Honzik *et al.* (9) concluded that tests even at the 21 month level gave a negligible correlation when compared with success on the Stanford-Binet at years six and seven. L. Dewey Anderson (2) constructed a new infant scale using items primarily from the Gesell Developmental Scales, and some items he himself developed. He tested 91 children at ages 3, 6, 9, 12, 18, and 24 months and then again at age 5 with the Stanford-Binet. Anderson reported similar findings to those of Bayley and Honzik. None of the correlation coefficients between the ages of 3 to 12 months was related to *IQ* scores at age 5. The scores of the subjects when tested at ages 18 and 24 months did show a trend toward significance, although not of enough magnitude as to be of predictive value. Anderson also found that the most important items in infant tests involved the use of language and the understanding of words. When these items were used alone in infant tests, a trend toward a significant correlation was found between 12 and 24 month subjects and later scores on the Stanford-Binet when the subject was 5.

Other investigators, such as Cavanaugh, Cohen, Dunphy, and Ringwald (5), Kralovich (10), and London (11), conducted studies which essentially replicated the earlier studies already reported. Their studies have reported results compatible with Bayley (3) and Honzik, MacFarland, and Allen (9). Although some attempt has been made to show the value of the infant scales through chi square instead of correlational statistical treatment, no particular value is seen in this method. It is the predictive validity in infant intelligence scales which is lacking. Inferential statistics could prove, if anything, misleading. This point of view is also shared by Anastasi (1) who saw no improvement in the infant intelligence test situation, although she did mention the results of the Donofrio (7) study which did use inferential statistics.

This completes a brief review of the literature. It can be concluded that the general consensus among psychologists is that the value of infant intelligence tests is quite limited. It certainly cannot be said at this time that the infant tests have established predictive validity. Scores on infant tests simply do not predict accurately the individual's *IQ* when he begins to develop conceptual thinking based on language between the third and sixth year.

As was stated earlier, two hypotheses have been developed to explain this lack of predictive ability. One is that the sensorimotor tasks in the infant tests simply do not measure the same cerebral functioning as that of the more mature child. The second hypothesis is that, due to the lack of maturity of the infant, the tasks of the tests are not sufficient to sustain the child's interest or motivation in the test, thus creating a situation in which both reliability and test validity are lost.

In the present study, the second hypothesis will be studied by attempting to build into the test incentives which will sustain the child's interest, thus increasing test reliability and possibly the validity of the Cattell Infant Intelligence Scale.

B. METHODS

1. *Subjects*

Forty profoundly retarded children, free of severe physical handicaps, participated in the study. Their mean age was 12.83 years, with a range of 9.2 to 14.8. The mean *IQ* was 9.35, with their mean mental age equaling 13.72 months. The population included 25 girls and 15 boys, all residing in a modern facility for 700 retarded children. The aide to child ratio never exceeded 12 to 1 and was usually much lower.

2. *Procedure*

The children were tested over a period of six months as their names came up for discussion of their ongoing programs by the Periodic Review and Staffing Committee at Murray Center. Subjects were placed at random, determined by a coin flip, into one of the two experimental groups. The first group whose N totaled 18 received the Cattell Infant Intelligence Scale in the standardized manner outlined by Cattell (4). The other group ($N = 22$) received the modified version of the Cattell, utilizing concrete reinforcers in the form of M&M's. In order to control for the possible cue function of the incentive, all the pieces of candy were brown in color. These reinforcers were inserted into the standard Cattell in 18 places. The insertions ranged from the third to the 16th month on the test (See Table 1). For example, in place of the cube in the 6th month, an M&M was placed in front of the child. As another example, in the 13th-14th month—glass frustration—the M&M was inserted behind the glass in place of the small toy. In all, the total expected change in mental age, if the child missed all items on the standardized test but passed the modified items, was 4.2 months.

TABLE 1
LEVELS OF CATTELL INFANT INTELLIGENT SCALE IN WHICH CONCRETE REINFORCERS WERE INSERTED

Month	Levels of the Cattell in which candy was inserted in place of standard test items	Mental age
3rd	Cube, regards, sitting	.2
4th	Activity increased at sight of toy	.2
5th	Pellet, regards, sitting	.2
6th	Cube, secures	.2
	Reach, unilateral	.2
7th	Pellet, attempts	.2
	Cube, takes two	.2
8th	Ring, pulls by string	.2
	Pellet, secures	.2
9th	Pellet, scissor grasp	.2
	Spoon (incentive) looks	.2
10th	Toy, uncovers	.2
	Third cube, attempts	.2
11th	Pellet, plucks	.2
	Cube under cup, secures	.2
13th & 14th	Cube, unwraps	.4
	Glass, frustration	.4
15th & 16th	Pellet-bottle, solves	.4
		Total 4.2

Two concrete reinforcers (M&M's) were placed into the mouths of the children receiving the modified version of the Cattell before actual testing began, while no such procedure was employed with children in the other group. All tests were administered and scored by psychologists certified by the Illinois Department of Mental Health.

C. RESULTS

A t test with unequal N's (8) was employed to determine the differences between the two groups of children. A significant difference was found in both *IQ* and mental age with the children having been administered the modified Cattell scoring higher. The mean difference in mental age was 3.10 with the t equaling 2.98 significant beyond the .01 level of confidence on a two tailed test. The average difference in *IQ* between the two groups was 2.34 with the t equaling 3.12 significant beyond the .01 level of confidence. The error variance of the *IQ*'s between the two groups was smaller than that of the mental ages, which accounted for the slightly larger level of confidence in spite of a smaller average difference.

D. DISCUSSION

The differences found in both mental age and *IQ* between the two groups lend support to Cronbach's (6) hypothesis that it is inconsistencies in attention and motivation that are at least in part responsible for the lack of predictive validity in infant tests. The assumption, which seems to have been implicit in those interested in test construction for individuals of low mental age, whether due to mental retardation or simply lack of cerebral development due to age, that the test items and objects themselves hold motivational value, can now be questioned. In other words, the wooden blocks, the plastic cubes, the simple toys, and other standard equipment which come with the infant tests apparently do not have the inherent motivational value they were felt to have, at least with the profoundly mentally retarded and probably for normal infants.

In interpreting the results it might be helpful to remember that the total expected difference in the design was 4.2 months. The results themselves revealed a mean difference of 3.10 months. While the figures themselves are small, they obtain more significance when the mean mental age of the entire subject population was only 13.72 months. It may also be helpful in conceptualizing the results by calculating the expected change in mental age as opposed to the actual change found in the experiment. This ratio of 3.10/4.20 comes to .738 or 73.8% of the total change in mental age incorporated in the experimental design actually was realized in the rise in mental age by the subjects receiving the incentives.

It was not the purpose of the experiment to attempt to dissociate the motivational *versus* the cue function of the incentive. Although procedures have been worked out in separating cue *versus* motivational functions of concrete incentives (e.g., 12), the authors did not feel these procedures relevant to the intent of the present study, that of showing that concrete reinforcers incorporated into an infant *IQ* test are capable of increasing the motivational value of the testing setting itself.

All that the design and procedure of this experiment did was to insert known motivators whenever feasible into the standardized test. This apparently did increase the motivation of the children, which led to more consistent, more accurate responding. The design, of course, did not try to incorporate items which would test Cronbach's (6) other assumption that lack of predictive validity is also due to a difference in the type of thinking the child uses to solve problems, specfically the lack of language mediation in children under 24 months of age.

It is hoped that this study will inject some life into the relatively sparsely researched area of infant intelligence, especially as it pertains to predictive validity. Although rating scales, such as the Vineland or Cain-Levine, are helpful in measuring the retarded child's relative level of functioning, it is felt they cannot replace the intelligence test entirely. Having working with children for several years, the authors are of the opinion that there are qualitative differences in intelligence, especially in the areas of nonverbal problem solving and in the formation of the concept of object permanency, which are not picked up by the infant intelligence tests now in use. With the concrete reinforcers employed as built-in motivators, however, the consistency of response was such that the psychologist could be much more certain if the child did in fact have these abilities, as: for example, the presence of the concept of object permanency. Knowing these facts, in turn, is of great assistance in the grouping accurately of children on their living unit for development of programs most beneficial to intellectual and social growth.

The next step in this investigation is a longitudinal study testing children of normal intelligence between the ages of 6 to 12 months and retesting these children at ages 3 to 4. It is hoped that the correlation data obtained in this study will enhance the use of infant tests, specifically by increasing their predictive validity.

E. SUMMARY

Forty profoundly retarded children were tested with one of two types of the Cattell Infant Intelligence Scale. Twenty-two of the children received a modified version in which a concrete reinforcer in the form of candy was substituted in place of the regular test material. The other 18 children were tested with the use of the standard procedures outlined in the Cattell manual. The children who received the modified Cattell scored significantly higher than children receiving the standard Cattell in both mental age and *IQ*. It was the opinion of the investigators that the influence of the candy was to increase motivation, consistency of response, and to give the tester a clearer picture of the cognitive structure of the child being evaluated.

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MEASURING SINGLE-LETTER CUE SELECTION IN PAIRED-ASSOCIATE LEARNING: A METHODOLOGICAL NOTE*[1]

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A. INTRODUCTION

Postman and Greenbloom (3) recently introduced a double-criterion technique for measuring single-letter cue selection in paired-associate (PA) learning. As with earlier letter selection studies, Jenkins (1) and Newman (2), their experiment was conducted in two phases. First, subjects acquired a list of PAs in which stimuli were redundant trigrams (units with no duplication of letters); second, subjects were then immediately tested for single-letter cue selection. In measuring letter selection, Postman and Greenbloom presented single-letter cues and asked their subjects to produce both the appropriate response terms *and* the missing letters. The purpose of this procedure was to separate correct responses which were achieved through a mediational process (by means of interletter associations) from those actually accomplished by use of a single letter. The method described by Postman and Greenbloom involved the use of *separate* groups of subjects for measuring transfer to each of the stimulus elements. Indeed, Postman and Greenbloom have cautioned against using their technique when transfer is to be measured with a within-subjects design. Nevertheless, some investigators—for example, Wichawut and Martin (4)—have not followed this advice, and as a result, their work may reflect artifacts of measurement.

We have attempted to develop a technique which is more useful than that of Postman and Greenbloom for measuring single-letter cue selection with a *same-subjects design.* This notion will be expanded by proposing (*a*) that Postman and Greenbloom's procedures are *not* suitable for assessing letter selection with a same-subjects design; and (*b*) that our "within-subjects double-criterion method" is a logically sound procedure for separating instances of single-letter selection from instances of mediation within the framework of a same-subjects design. Finally, we will present data which illustrate

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that the within-subjects double-criterion approach may be a useful analytical procedure. This latter presentation is only tangentially related to the major argument—it provides *empirical* support for the usefulness of the within-subjects double-criterion.

B. THE PROBLEM

In the double-criterion method described by Postman and Greenbloom (3), the same subject is measured for both interletter associations *and* cue-response associations. Both of these measurements are necessary for inferring the nature of the functional stimulus during PA learning. To illustrate this procedure, consider the pair XRT: 4. With a repeated measurements approach to measuring letter selection, the tests for this pair required of the same subject would be (*a*) presented X as a cue, reproduce "R," "T," and "4" (test for first-letter selection), (*b*) presented R as a cue, reproduce "X," "T," and "4" (test for second-letter selection), and (*c*) presented T as a cue, reproduce "X," "R," and "4" (test for third-letter selection). Each response recall would be examined to determine whether it was right or wrong. The *correct* recalls would then be categorized on the basis of the amount of "missing" letter reproduction, 0, 1, or 2 missing letters reproduced. Recalls falling in the 0-category would be taken as providing support for the view that the subject had used a single letter as his functional stimulus during PA learning. Similarly, recalls falling in the 1-category would be taken as supportive of the notion that the subject's effective stimulus was a two-letter unit—the test letter and the correctly reproduced missing letter. Finally, those recalls falling in the 2-category would be taken as support for the view that the subject's functional cue was a three-letter unit—the entire trigram in which the test letter had been presented.

We believe, along with Postman and Greenbloom (3), that these procedures are not suitable for measuring letter selection with a same-subjects design. The crux of our argument concerns the fact that, as given by Postman and Greenbloom, the *same* subject is tested for both interletter and cue-response associations. It seems unlikely to us that three separate two-component tests of each PA pair will be completely independent of one another. (It should be noted here that nine different measurements could be obtained from the same subject for each pair in the list—the two missing letters and the correct response on three separate occasions.) We will make certain assumptions and attempt to show how testing for both kinds of associations within the same subject could lead to unwanted interactions that would increase the possibilities for drawing spurious conclusions.

It appears reasonable to us that measuring interletter and cue-response associations to each letter of the same trigram could encourage an interletter mediational strategy. That is, obtaining both kinds of measurements from the same subject for each PA pair seems likely to induce a "test-taking strategy" in which attempts are made to recall letter : letter associations in order to anticipate correctly letter : digit associations. Such an outcome would mean, in effect, that the very procedures which were designed to minimize the influence of interletter mediation on the assessment of letter selection would, instead, maximize it. If these procedures do bring about mediation as a *test-taking* strategy, they could also mislead us into believing that mediation had been an actively employed *acquisition* strategy. An important assumption which we are making here is that human subjects are capable of remembering their *earlier* responses (missing letters and digit responses) at some point later in the test series, say, when they are presented the second or third single-letter test for a given PA.

Here is a concrete example of how confusion and false inferences could arise from application of Postman and Greenbloom's two criteria to the same-subjects design. Suppose, first, that a particular subject had learned the pair XRT: 4 by using "X" as his functional cue and the pair PVW: 2 using "PW" as his functional cue. For each pair there would be three response-recalls and three attempts at missing-letter reproduction. Now suppose that no interletter associations were formed involving the nonfunctional letters (R, T, and V) such that these letters would not lead to the correct digit response nor to the appropriate missing letter(s). What would happen when our subject is requested to recall the missing letters and digit associated with a *nonfunctional* single letter after he already has attempted recall to his *functional* cue of the same PA? Clearly, one possibility is that the subject might try to "hook" the nonfunctional letter to his functional stimulus and its corresponding response. As an example, assume that our subject had been presented X and that he had correctly recalled the response but neither of the two missing letters. When R (a nonfunctional letter) is presented later in the test series, the subject might guess that R had been presented along with X and achieve the correct response by interletter mediation. Upon consideration of how missing-letter reproduction is used to categorize items yielding a correct digit recall, it becomes obvious that this sort of guessing technique would cause us to *underestimate* the relative incidence of single-cue utilization by overestimating the relative incidence of two- and three-letter selection, respectively. If the nonfunctional letter were connected to an inappropriate functional stimulus : response sequence, it would not yield a correct digit recall for categorization.

It is not difficult to imagine that the amount of single-letter cue selection could be even further underestimated if some subjects had incidentally acquired interletter associations during PA learning. What we are suggesting is that subjects might be able to use these incidentally learned interletter associations to aid them in their attempts at guessing the response appropriate to nonfunctional letters. In this case, the guessing strategy, presumably activated by repeatedly recalling the missing letters and digit of a given PA, would result in even more categorization errors. The nonfunctional letter would be *more* likely in this case to lead to the correct functional cue-response sequence. Again, two and three-letter selection categories would be inflated at the expense of the single-letter category.

It would seem that what is needed is another approach to extricate single-letter cue selection from interletter mediation—one which does not require concomitant measurement of missing letter reproduction. In the next section we will describe a technique which we believe to be suitable for this purpose.

C. A Proposed Solution

We have developed a way of *scoring* single-letter cue selection findings based on the use of repeated measurements transfer designs. A double criterion, similar conceptually to that of Postman and Greenbloom (3), was developed from observations of subjects' *patterns* of responding across the three positions of the same trigram. This within-subjects double criterion technique assumes that a given PA item can be "solved" in one of three general ways: (*a*) by a single-letter solution in which only one of the three letters of a trigram yields the correct response; (*b*) by a two-letter solution in which only two letters of a trigram produce the correct response; or (*c*) by a three-letter solution in which all three letters of a trigram lead to the correct response.

Using the abbreviations FL, SL, TL for the first letter, second letter, and third letter, respectively, we can show that any trigram can be solved by only one of seven operationally distinguishable solutions: FL-only, SL-only, TL-only, FL + SL, FL + TL, SL + TL, and FL + SL + TL. Only the first three of these, the single-letter solutions, are taken as evidence that the subject relied exclusively upon a single letter for producing the correct response. To cite a concrete example, let "X" represent a correct digit recall and "O" a failure to recall the appropriate digit; then the three possible *patterns* of *correct* responses indicative of single-letter cue selection would be XOO, OXO, and OOX for first-letter, second-letter, and third-letter selection, respectively. Only these single-letter solutions meet the dual criteria for inferring single-letter cue selection within the framework of the same-subjects design: (*a*) a correct response to an individually presented letter; and (*b*) an absence of correct responding to the "other" letters from the trigram. (Neither two- nor three-letter patterns of correct responding are considered as supporting single-letter cue selection, primarily, because these solutions *may* have involved interletter associations.) These criteria are, of course, similar to those of Postman and Greenbloom (3). We do not believe, however, that their *methodology* is compatible with the same-subjects design (although, we do recommend its use in different-subject transfer designs). When a same-subjects design is to be used, we feel that our double-criterion technique accomplishes the same objectives as Postman and Greenbloom's methodology, but, at the same time, has the distinct advantage of not requiring concomitant measurement of interletter associations.

D. Supporting Data

We have recently collected some data with retardates using the redundant-trigram PA task and a repeated measurements transfer design. In this experiment, all subjects were first taught the responses and then they learned five PAs to one of the following criteria: 1, 2, 3, 5, 7, 2 perfect, or 8 overlearning trials. All were then immediately tested for single-letter cue selection with each letter of each trigram. In this same-subjects design, the single-letter cues were presented in a scrambled fashion, with the restriction that letters from the first, second, and third positions were about equally represented in the beginning, middle, and end of the test-item series. Table 1 shows the means and *SD*s of correct responses made in transfer to the single-letters of the trigrams.

Two sets of means and *SD*s are presented in Table 1: (*a*) scoring according to a single criterion (a correct response to any one of the letters was the sole criterion for inferring single-letter cue selection), and (*b*) scoring according to the within-subjects dual criteria. It can be seen that the latter scoring method is consistently the more conservative of the two methods of measuring single-letter cue selection.

There is also another major difference between the two scoring methods. The single-criterion, but not the double-criterion technique, suggests that the amount of first-letter selection increases as a direct function of the amount of PA practice (Trial Condition). Separate 3 × 7 (Letter Position × Trial Condition) mixed analyses of variance and appropriate simple effects analyses revealed that Trial Condition was a significant variable for first-letter cue

TABLE 1

MEANS AND *SD*s (IN PARENTHESES) OF CORRECT RESPONSES IN TRANSFER TO SINGLE LETTERS FROM THE FIRST, SECOND, AND THIRD LETTER POSITIONS GIVEN EITHER SINGLE-OR DOUBLE-CRITERION SCORING FOR EACH OF THE SEVEN SUBROUPS OF RETARDATES THAT EXPERIENCED DIFFERENT DEGREES OF PA LEARNING

Trial condition	Single criterion Letter position			Double criterion Letter position		
	FL	SL	TL	FL	SL	TL
one	.5	.9	1.3	.3	.8	1.0
	(.7)	(1.0)	(.7)	(.7)	(.9)	(.8)
two	1.5	1.6	1.3	.7	.7	.8
	(1.0)	(1.3)	(1.3)	(.7)	(.7)	(.8)
three	1.9	1.6	1.7	.7	.5	.3
	(1.5)	(1.4)	(1.8)	(.8)	(.5)	(.7)
five	1.6	1.7	1.8	.7	.7	.8
	(.8)	(1.3)	(1.0)	(.7)	(.7)	(.6)
seven	2.9	2.0	2.0	.9	.8	.3
	(1.1)	(.8)	(1.4)	(.7)	(.8)	(.7)
two perfect	3.2	1.9	1.9	1.1	.3	.2
	(1.2)	(1.2)	(1.3)	(1.1)	(.7)	(.4)
eight	3.0	1.7	3.3	.8	.1	1.2
overlearning	(1.6)	(1.3)	(1.2)	(.9)	(.3)	(1.0)

Note: For the single criterion, all correct responses to a single-letter cue were taken as support for single-letter selection, but for the double criterion, single-letter cue selection was inferred only when a correct response was produced to only one of the three possible trigram letters.

selection in only the single-criterion analysis ($p < .01$). In other respects, the two modes of analysis produced similar outcomes.

Table 2 presents the remaining data resulting from the use of the within-subjects double-criterion technique, the means and SDs of correct responses which were given to more than one letter of a trigram (i.e., correct responses given in two-letter and three-letter combinations). A comparison of these data reveals that two-letter selection, but not three-letter selection, increased as a direct function of trials ($p < .01$). When we consolidate the results of the different double-criterion analyses, we are led to the conclusion that it is actually two-letter solutions which increase across trials. Here, then, we see an example of the analytic usefulness of this within-subjects technique. It provides separate estimates of the amounts of single-letter, two-letter and three-letter selection (as the method of Postman and Greenbloom), and it also appears to be a more sensitive index of letter selection than a single criterion approach (again, as the method of Postman and Greenbloom).

E. SUMMARY

A method of scoring single-letter cue selection data is described. The purpose of this "within-subjects double-criterion technique" is the same as for

TABLE 2
MEANS AND *SD*s (IN PARENTHESES) OF CORRECT RESPONSES THAT OCCURRED IN TWO-LETTER OR THREE-LETTER SELECTION PATTERNS

Trial condition	Two-Letter solutions	Three-Letter solutions
one	.3 (.7)	0.0 (0.0)
two	.8 (.9)	.2 (.4)
three	.8 (1.0)	.7 (.8)
five	.9 (.9)	.3 (.5)
seven	2.0 (1.5)	.3 (.5)
two perfect	1.8 (1.3)	.6 (.8)
eight overlearning	1.6 (.8)	.9 (.9)

the double criterion proposed by Postman and Greenbloom (3): to separate instances of *single-letter cue selection* from instances of *mediation* based on *interletter* associations. An argument is offered to the effect that this within-subjects double-criterion method is actually more useful than that of Postman and Greenbloom—in any situation involving *repeated* testing of the same subject for single-letter selection. The force of the argument is related to the fact that the Postman and Greenbloom procedure requires tests for interletter associations in addition to tests for cue selection. It is quite likely that successive tests of the same PA for both interletter and cue: response associations would not produce independent recalls. Data are also presented to show that the newer double-criterion technique which focuses on *patterns* of cue-response performance, and which does not require measurement of interletter associations, may prove to be a useful analytical procedure.

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SENSORY DEPRIVATION *VS.* SENSORY STIMULATION DURING EARLY DEVELOPMENT: A COMMENT ON BERKOWITZ'S STUDY*

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The findings reported by Berkowitz (1) are extremely interesting, informative, and consistent with theoretical formulations and experimental results relating sensory deprivation to stimulus-seeking behaviors, (4, 5, 6, 7, 9, 10). It is the intention of this comment to suggest that Berkowitz's conclusion (1, p. 192) that "The results as a whole do not support optimal-arousal theory; nor do they fall under the exclusive domain of any other extant theory of the phenomena" is not entirely correct and that his remarks "while the present data favor a deficit-oriented more than an optimal-arousal stance, unilateral application of the former to the infantile experience and/or sensory reinforcement areas is premature" (1, p. 194) is, in fact, not consistent with the early deprivation and stimulation literature.

In the references listed above a theoretical formulation has been offered that sensory deprivation during early development leads to stimulus-seeking behaviors that are related to the sensory system that has been deprived; further, that hyperactivity, hyperreactivity, and increased violent-aggressive behaviors commonly reported following maternal-social deprivation in mammals represent forms of stimulus-seeking behaviors which are attributable to somatosensory deprivation and not to deprivation of the other sensory systems. With respect to underlying mediating neural mechanisms, this writer has extended and emphasized the relevance of Cannon's Law of Denervation Supersensitivity (10) in accounting for the neural-behavior effects of early sensory deprivation, as initially observed by Riesen (14). Riesen (11, 12, 13, 14, 15) can be constructively consulted for a thorough analysis of the many aspects of early sensory deprivation upon neural-behavioral ontogeny. Additionally, Cannon and Rosenbleuth (2), Stavraky (17), and Sharpless (16) may be consulted for a thorough and systematic treatment of denervation supersensitivity phenomena. It is the contention of this writer that early experimental

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sensory deprivation studies represent a special case of functional sensory deafferentation and, in particular, that the abnormal social-emotional behaviors resulting from maternal-social deprivation are due to partial functional *somatosensory* deafferentation. If early sensory deprivation is sufficiently severe, not only does denervation supersensitivity appear, but transneuronal agenesis and/or transneuronal degeneration effects can also be expected (6, 8, 9, 10).

The findings of Berkowitz (1) are very much consistent with the predictions derived from the above theoretical formulations and the experimental early deprivation literature. His report of a magnitude effect for both sensory system modalities (visual and auditory)—i.e., the most deprived group engaged in significantly more stimulus-seeking behaviors than the least deprived group—is a remarkable demonstration of the validity of the early sensory deprivation hypothesis, as are his findings that nonstimulated animals engage in significantly greater stimulus-seeking behaviors than the stimulated groups. A final comment on his failure to find a significant main effect with the sound treatment groups appears appropriate. Berkowitz's conclusion "that sound is simply not as potent a source of stimulation to rats as is light" (1, p. 192) appears premature and is not necessarily consistent with the findings of Tees (18) where a group of rats with ear plugs were compared with a group of rats reared with normal auditory input from the laboratory colony. He found that restricted and normal animals did not significantly differ in learning a frequency discrimination task; however, significant differences were obtained upon two auditory pattern discrimination tasks. Berkowitz (1) rightly points out that self-generated sounds in the home cages was an uncontrolled source of stimulation which undoubtedly contributed to the nonsignificant main effect in the sound treated group. The results of Tees (18) are supportive of that interpretation; however, the additional difference between pure frequency and complex pattern frequency stimulation and perception appear to be an additional but extremely important variable that was insufficiently emphasized by Berkowitz; i.e., test criteria utilizing pure tone frequencies may be generally too insensitive to detect treatment effects and that pattern stimulation criteria may be a requirement for an effective testing procedure.

The above comments are offered to indicate that there does exist an extant theory of exclusive domain which can account for the findings of Berkowitz (1) and, further, that the developmental sensory deprivation theory is quite specific with respect to expected effects of differing sensory system deprivation during early development. Far from being premature this point of view has sufficiently matured to provide a useful explanatory system to account for the marked variations in the quality and quantity of early sensory experiences in understanding the developing brain and behavior.

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ASSESSING AGGRESSIVE AND FRIENDLY BEHAVIORS IN YOUNG CHILDREN*[1]

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A. INTRODUCTION

At the present time, when we observe so much violence in our society and hear so much talk about "love," it is of interest to look at aggressive and friendly relations during the early years of childhood and try to gain a better understanding of their development and overt expression. For the past nine years, the Child Development Center has been engaged in a longitudinal study of the development of a population of young children attending nursery schools in the community (7). The present study is an outgrowth of the long range study and attempted to assess the overt expressions of aggressive and friendly behavior in order to determine whether it was possible to detect developmental trends and sex differences.

Methods of appraising children's behaviors have varied, depending on the investigator's theoretical orientation and the grossness of the concepts used. Many have used descriptive observational material to assess aggressive behavior (2, 3, 5, 6, 9, 12, 13, 14, 15, 16, 17, 18) though their methods of data collection varied from categorizing the observational material after it was obtained to checking lists as the behavior was observed, and their definitions of aggression varied from antisocial behavior to self-assertive behavior.

Only a few (10, 11, 18) have examined the relationship between aggressive and friendly behavior and have indicated that the two types of behaviors are related in a variety of ways. However, several conflicting trends in the increase or stability of aggressive and friendly behavior have been found, and Buss (4) suggested that the discrepancies may be due, in part, to a general lumping together of many types of scores under one heading, rather than subdividing them into meaningful categories.

It is our intention to heed Buss' (4) warning and to look not only at gross behavioral manifestations of aggression and friendliness, but also at finer distinctions of this behavior.

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B. METHOD

1. *Subjects*

The children who participated in this study were from a community nursery school in the metropolitan New York City area. These children are a select sample of children participating in the long range study being conducted by the Child Development Center. The majority of fathers and mothers were college graduates, pursuing careers in business, the professions, or the arts. The families were small in almost every case, with the study child being the only child or one of two children.

An initial sample of 11 boys and 11 girls was chosen to try out a technique of assessing observable behaviors. For each of these 22 children we had six observation periods: two at approximately four years of age, two at approximately five years of age, and two at approximately six years of age.

2. *Procedure*

Each child was observed in the nursery-school setting for 20 minutes at a time on two different occasions, approximately one week apart and at each of the three age levels. About two-thirds of the observations were recorded during free play periods and about one-third during structured periods, such as organized games, snack time, rest time, etc. Each scheduled observation consisted of a detailed, running-narrative recording of a behavior sequence within the limited context of the nursery-school setting. The observers attempted to make a record of "everything" that happened; and the recorded material was then subjected to a content analysis by two judges in the effort to quantify it.

Several other investigators have defined aggressive behavior in a variety of ways, but have usually included the necessity for a judge to determine the motives and intents of the aggressor or the vulnerability of the object of aggression (1, 4, 17, 18).

We defined an *aggressive act* as one which is initiated by one person, which has a noxious content and/or effect, and which is directed at another person or persons. Though some judgment is still involved, it is minimized because we have two criteria—content and/or effect—rather than just one. Some examples of aggressive acts are throwing an object at a child, fighting, rejecting ("Go away."), showing negative affect ("I hate you."), criticizing, coercing.

We defined a *friendly act* as one which is initiated by one person, which is pleasant and positive in content and/or effect, and which is directed at another person or other persons. We did not try to assess intents or needs. Some examples of friendly acts are hugging another child, smiling at another, showing positive affect ("I like you.").

The aggressive and friendly acts were also coded in terms of whether they were physical or verbal and whether they were direct or indirect. The *physical* and *verbal* distinction simply describes the mode of delivery: that is, by action or by word. We defined a *direct act* as one which is delivered with the recipient of the act obvious and present, and involves an action upon the integrity or body of the recipient. Some examples of direct acts are pushing, hitting, hugging, "I like you," "I hate you." An *indirect act* was defined as one which is not aimed at the recipient *per se,* but at something valued by him, or one that is aimed at the recipient via some other route such as tattling. Some examples of indirect acts are taking another child's toy, knocking over a child's structure, "That's an ugly picture," "I like your dress."

Each act was also coded as to whether it was an *initial contact-making* act: i.e., one that occurred with no obvious antecedent action on the part of the recipient of the act; a *response* to the friendly or aggressive act of another child; or whether it occurred after contact had been made.

Because we were interested in children's interactions with other children, we coded only those aggressive or friendly acts which were aimed at other children, and coded each act as being directed at a boy or at a girl.

Each act, then, is judged in five specific areas. Example 1: *S* joins a boy in parallel play. This would be coded as friendly, physical, indirect, initial contact, and aimed at a boy. *Example 2:* While playing with a girl, *S* says to her "That's a pretty picture." This would be coded as friendly, verbal, indirect, not initial, and aimed at a girl. *Example 3: S* says to a boy "Stop it," after the boy had struck *S*. This would be coded as aggressive, verbal, direct, a response to an aggressive act, and aimed at a boy.

C. RESULTS[2]

1. *Reliability and Validity*

The two judges who coded the observation reports had a total agreement of 83%, and they agreed significantly on each of the three dimensions (aggressive-friendly, physical-verbal, and direct-indirect). A third judge also coded some of the reports and did not differ significantly from the other two. We took this as indicating acceptable reliability. The validity of our assessment technique was determined to be acceptable by comparing the results of the present study with those of similar studies (17, 18).

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[2] All differences between the sexes are statistically significant at the $p < .05$ or $p < .01$ level, unless otherwise stated.

2. *Interactions*

We use the term "interactions" to include all three types of acts: the initial contact-making acts, the responses, and the not-initialed acts.

The boys tended to have about the same total number of interactions at all three age levels, whereas the girls showed a sharp decrease between the ages of five and six—the "socialization process" seemingly resulted in their being less social. This may be related to our finding that the majority of girls at age six were judged by our clinicians as showing interference with development in significant areas (8).

The girls had fewer interactions than did the boys at all three ages, with the biggest difference between the sexes occurring at the age of six.

a. Interactions with children of each sex. At all age levels, both boys and girls interacted more often with children of the same sex than with children of the opposite sex. As the children became older, the proportions of interactions with children of the same sex increased, while the proportions of interactions with children of the opposite sex decreased (see Figure 1). In line with this trend, we found that both boys and girls had more of each type of interaction (aggressive, friendly, physical, verbal, direct, and indirect) with

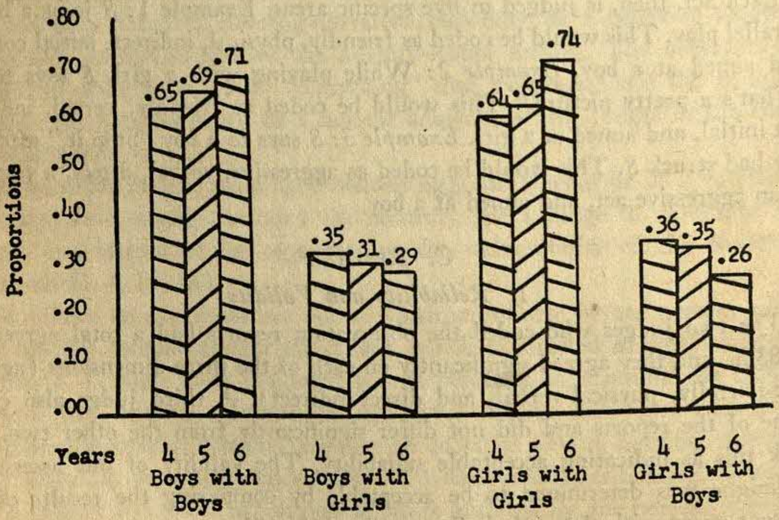

FIGURE 1
PROPORTIONS OF INTERACTIONS WITH CHILDREN OF THE SAME AND OF THE OPPOSITE SEX
Proportion = Number of interactions with specific sex/total no. of interactions.

TABLE 1
CHANGES IN THE PROPORTIONS OF THE VARIOUS TYPES OF INTERACTIONS OVER A THREE-YEAR PERIOD

Type of interaction	Age level		
	four years	five years	six years
Boys			
Aggressive	.58	.40	.34
Friendly	42	.60	.66
Physical	.58	.53	.53
Verbal	.42	.47	.47
Direct	.31	.25	.22
Indirect	.69	.75	.78
Girls			
Aggressive	.42	.34	.35
Friendly	.58	.66	.65
Physical	.46	.45	.46
Verbal	.54	.55	.54
Direct	.16	.11	.19
Indirect	.84	.89	.81

Note: Proportion = Frequency of specific type of interaction/total no. of interactions.

children of the same sex than with those of the opposite sex at each of the three age levels.

b. Aggressive and friendly interactions. At all three ages, both boys and girls had greater proportions of friendly interactions than aggressive interactions, except the boys at age four, who had a greater proportion of aggressive than friendly interactions (see Table 1).

The boys had a much greater proportion of aggressive and lesser proportion of friendly interactions at the age of four than did the girls at the age of four. However, the boys' aggressive interactions decreased and their friendly interactions increased more dramatically than the girls' between the ages of four and five, and so by the age of six the differences between the two sexes were practically nil.

c. Physical and verbal interactions. At all three ages the boys had greater proportions of physical than verbal interactions, though only at age four was the difference statistically significant. The girls, on the other hand, had a greater proportion of verbal than physical interactions at all three ages (see Table 1).

We found that neither the boys' nor the girls' proportions of physical and verbal interactions changed significantly over the three year period, though by the ages of five and six, the differences between the sexes were much less than they had been at the age of four.

It is interesting to note that both boys and girls had fewer physical and more verbal interactions with girls as they became older, although no such trend was found in their interactions with boys. This could be the result of the social influence that; for example, physical aggression toward girls is disapproved, while verbal aggression is more accepted.

d. Direct and indirect interactions. Both boys and girls had greater proportions of indirect interactions than direct interactions at all three age levels (see Table 1). Again, the major change for the boys occurred between the ages of four and five. Their proportion of indirect interactions increased, while the proportion of direct interactions decreased. The girls demonstrated no consistent trends. Though the boys had a greater proportion of direct and lesser proportion of indirect interactions than the girls at all three ages, the difference at age six was much less than at the other two ages.

e. Modal descriptions. At four years of age, the *boys* were perceived as typically performing *indirect, physical aggressive acts,* while the *girls* were perceived as typically performing *indirect, physical friendly* acts.

At five years of age, the *boys* were perceived as typically performing *indirect, physical friendly* acts, as had been the case for the girls at the age of four. The *girls* continued to interact mainly with *friendly* acts but they were more often *indirect and verbal* rather than indirect and physical as they had been the year before.

At the age of six, the *boys* continued to be perceived as typically performing *indirect, physical friendly* acts, and the mode of the *girls* was the same as that at age five: i.e., *indirect, verbal,* and *friendly.*

In summary, for the boys, the main change in the mode was from aggressive to friendly, while for the girls it was from physical to verbal. As can be seen in Table 2, most of the changes in the proportions of interactions for the girls were not statistically significant, while most of the changes for the boys were. This would suggest that the girls had reached a stable level before the age of four, and that the boys were approaching the girls in the kinds of changes that occurred.

f. Relationships between aggressive and friendly interactions. When a child engaged in many aggressive interactions, he also tended to engage in many friendly interactions, though the relationship was not statistically significant for the boys at the five year age level (at age 4, $r = .66$, $p < .01$; at age 5, $r = -.10$; at age 6, $r = .74$, $p < .01$) nor for the girls at the four and five year level (at age 4, $r = .38$; at age 5, $r = .26$; at age 6, $r = .56$, $p < .01$). We also found that the boys whose interactions were predominantly aggressive at age four had interactions predominantly aggressive at ages five and six; while those boys whose interactions were predominantly friendly at age four had interactions predominantly friendly at ages five and six (statistically significant

TABLE 2
AGES BETWEEN WHICH SIGNIFICANT[a] CHANGES IN THE PROPORTIONS OF ACTS OCCURRED

Acts	Boys	Girls
Aggressive acts	$4 > 5^{**b}$	NS
Friendly acts	$4 < 5^{**c}$	NS
Physical acts	NS	NS
Verbal acts	NS	NS
Direct	$4 > 6^{*b}$	NS
Indirect acts	$4 < 6^{*c}$	NS
Aggressive physical acts	$4 > 5^{*b}$	NS
Aggressive verbal acts	$4 > 6^{*b}$	$4 > 6^{*b}$
Friendly physical acts	$4 > 5^{*b}$	NS
Friendly verbal acts	$4 < 6^{**c}$	NS
Aggressive direct acts	$5 > 6^{**b}$	$4 > 5^{**b}$
Aggressive indirect acts	$4 < 5^{**c}$	$4 < 6^{*c}$
Friendly direct acts	$4 < 6^{**b}$	$4 < 5^{**c}$
Friendly indirect acts	$4 < 5^{**b}$	NS

Note: NS = not significant.
[a] Used Z test to compare proportions (two tailed).
[b] Denotes decrease.
[c] Denotes increase.
* $p < .05$.
** $p < .01$.

only between the ages of four and five with $r = .66$, $p < .05$). For the girls, we found no consistent relationship.

3. *Initial Contact-Making Acts*

An act was called "initial contact" when it occurred with no obvious antecedent action on the part of the recipient of the act.

Just as with interactions, we found that both boys and girls made more initial contacts with children of the same sex than with children of the opposite sex. In line with this, the children also made more aggressive, as well as friendly, initial contacts with children of the same sex than with children of the opposite sex. For both boys and girls, aggressive initial contacts with children of both sexes decreased, but only the girls' friendly initial contacts increased with children of both sexes. The boys' friendly initial contacts increased with other boys, but not with girls.

At age four, both boys and girls were perceived as initiating more aggressive than friendly contacts. By the age of six, however, both boys and girls initiated at least three times as many friendly as aggressive contacts.

At each of the three ages the boys had a higher proportion of aggressive and lower proportion of friendly initial contacts than did the girls, with the biggest difference between the sexes occurring at age five.

4. *Responses to Aggressive and Friendly Acts*

Responses were coded as acceptance, anxiety, aggressive, or friendly. Boys tended to respond to the aggressive acts of other children with aggressive acts and to the friendly acts of other children with friendly acts. Girls were generally more accepting of aggressive acts from both sexes than were the boys. Little change was apparent over the three years in the type of responses to aggressive or friendly acts for the girls, whereas the boys' aggressive responses to the aggressive acts of other boys did decrease with age.

D. SUMMARY AND IMPLICATIONS

Although based on a small sample of children, our findings would indicate certain developmental trends and sex differences. Between the ages of four and six, there seems to be the development from aggressive to friendly and from direct to indirect interactions. The change from physical to verbal interactions was not statistically significant for either sex.

There was more change from aggressive to friendly interactions than from physical to verbal or from direct to indirect. The change from direct to indirect seems to have occurred earlier than the others, and the change from physical to verbal would be expected to occur at a later age.

For all of these types of interactions, the change in the girls appears to occur at an earlier age than the change in the boys; so that observing the girls at a given age might predict the kinds of interactions of the boys a year or two later.

By the age of six, there was greater similarity between the sexes in the proportions of the various types of acts, than at the ages of four or five, and the similarity at age six seems to be more the result of changes in the boys than in the girls.

The greatest difference at age six between the sexes was in the *number* of interactions, the girls having only about half as many as the boys. Not only did the girls have fewer interactions than the boys, but fewer at age six than at age four. This raises many questions. Is the decrease due to the more repressive influence of society on the girls? Is the decrease in interactions related in some way to a maturing or "settling-down" process in the girls? Or is the decrease due to longer periods of interactions by girls with one child, which were coded as one continuous interaction rather than several interactions? The fact that boys and girls showed similar proportions of aggressive, friendly, and direct and indirect acts at age six would indicate that our image of girls as more inhibited at that age is not due so much to the types of interactions, as to other factors.

Another developmental trend found for both boys and girls was the increasing proportion of interactions with children of the same sex and the decreasing proportion of interactions with children of the opposite sex.

Our findings also suggest that a child's style of interacting is established at an early age. For example, children who had many aggressive interactions also had many friendly interactions. In addition, boys who were predominantly aggressive or predominantly friendly at age four tended to be the same at ages five and six. This was not so for the girls, and raises a question of whether, for some reason, it is more difficult for girls than for boys to establish a consistent style of interacting.

Finally, this exploratory work has shown the feasibility of this approach and has raised questions for further, more systematic studies.

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CORRELATION BETWEEN THE IMMEDIATE TEST AND THE WECHSLER ADULT INTELLIGENCE SCALE VERBAL SCALE IN THE REHABILITATION SETTING*

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A. INTRODUCTION

While numerous articles can be found delineating the problems involved in the psychological testing of orthopedically handicapped individuals (1, 5, 6, 8), there appears to be a paucity of reported efforts to standardize a short, easily administered, and valid intelligence test for a population of severely, physically disabled persons. Cull and Colvin (4) showed that the Quick Test (QT) and the Wechsler Adult Intelligence Scale (WAIS) Verbal Scale (10) were highly correlated and concluded that the QT which requires picture identification could be utilized for a quick assessment of intellectual functioning among severely handicapped persons.

According to Corsini (3) the Immediate Test: A Quick Verbal Intelligence Test is suited for "provisional objective evaluation by workers who are not trained psychometrists." Since the test is so easily administered, is a verbal test of intelligence, and published data on the test (3, 7) suggest that this test shows both reliability and a high degree of correlation with Forms 1 and 2 of the Wechsler-Bellevue Intelligence Scale (9), the authors wished to evaluate it as an effective measure of intelligence with severely, physically handicapped rehabilitation clients.

The most widely accepted diagnostic instrument for evaluation and prediction in vocational rehabilitation has been the WAIS (2). However, the time consumed in administration of the WAIS may make it uneconomical. The Immediate Test could be used for the testing of a population with physical disabilities, since is permits *S*s to make a simple verbal response. Since the WAIS has been accepted as a valid and reliable instrument of general intelligence, it was chosen as a standard with which the Immediate Test could be compared when administered to the severely, physically handicapped population.

B. METHOD

A group of 54 severely, physically handicapped individuals were selected at random from patients whose disability had stabilized and who were involved

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in a physical medicine and rehabilitation program at the Texas Institute for Rehabilitation and Research, Baylor University College of Medicine, Houston, Texas. Included in the study were *S*s with the following diagnoses: brainstem damage, polymyositis, hemiplegia (CVA), paraplegia, quadriplegia, Guillian-Barre Syndrome (involving four extremities), peripheral neuritis, severe pulmonary emphysema, spondylolisthesis, and severe rheumatoid arthritis involving four extremities).

The criteria for selection of subjects included (*a*) the duration of the disability was in excess of 12 months, in order to obviate as many adjustment problems as possible; (*b*) no obviously retarded subjects were selected; (*c*) the visual acuity of all subjects was 20/20 with best correction. *S*s' lower age limit was appropriate to the WAIS standardizations and no *S*s were selected who were older than 50 years of age.

Upon selection, *S*s were given the WAIS Verbal Scale (all subtests). After an interim of two to three months, the Immediate Test was administered to the group in the fashion described by Corsini (3).

C. RESULTS

It was found that the WAIS Verbal Scale score gave a mean *IQ* of 88.3, while the mean *IQ* of the Immediate Test was 88.6. The *t* test for correlated measures was used to evaluate the significance of differences between sets of scores. This was done by applying the *t* test first to the distribution of the highest 18 WAIS Verbal Scale scores and their corresponding Immediate Test scores, and again to the lowest 18 WAIS Verbal Scale scores and their paired Immediate Test Scores. The use of extreme groups had the effect of applying a more stringent test of significance than would be the case in using the entire distribution. It was found (see Table 1) that with 17 degrees of freedom for both comparison groups calculated *t* test values were 1.05 and .49, respectively.

Product moment correlation of the Immediate Test scores with the WAIS Verbal Scale scores was .797. There was no significant difference ($t = .21$

TABLE 1
PAIRED COMPARISONS OF WAIS VERBAL SCALE *IQ* SCORES AND CORSINI *IQ* SCORES

	WAIS Verbal Scale *IQ* Scores		Corsini Scale *IQ* Scores			
S Group	*M*	*SD*	*M*	*SD*	*t*	*df*
All ($N = 54$)	88.3	15.8	88.6	17.2	.21	53
Upper ($N = 18$)	106.7	7.2	108.9	9.7	1.05	17
Lower ($N = 18$)	71.8	6.9	72.6	6.9	.49	17

with 53 *df*, $p < .001$) found between the mean *IQ* scores on the Immediate Test and the mean *IQ* scores on the WAIS Verbal Scale.

On the basis of the study, it appears that the WAIS Verbal Scale and the Immediate Test yield comparable *IQ* scores for a severely disabled population. However, these tests are not comparable in the skills assessed or when the time and difficulty involved in administration are considered. Since the Immediate Test both fulfills the goal of a reliable estimate of *IQ* and does so more economically, it would appear that the Immediate Test could be used effectively as a screening device in vocational rehabilitation settings for obtaining a quick measure of the level of intellectual functioning.

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REFLECTIONS ON THE CATEGORIZATION OF HUMAN EXCELLENCE*[1]

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A. NATURE OF THE PROBLEM

Categorization is one of man's survival mechanisms. Only by employing categories can man respond and adjust to the constant bombardment of distinctive stimuli from his internal and external environments. Categorization is a cultural phenomenon par excellence, and, according to Triandis (7, p. 18), "there is considerable evidence that cultural influences in part determine the number of categories employed by members of a culture to describe particular areas of their cognitive domains, as well as the content and the criterion attributes of the categories that they employ." Moreover, this man-made categorization involves the "act of invention" (1). In other words, there is a constant interplay between categories and persons so that a person's cognition is determined, to some extent, by the categories available to him, and people continuously modify old categories and invent new ones.

One of the categories that is particularly sensitive to cultural changes is the category of human excellence. Most cultures tend to reflect their values through the selection and preservation of persons, real or imagined, who embody those values and virtues. Examples of efforts to identify human excellence are readily available in the *Dictionary of National Biography, Who's Who,* and the many annual awards of national and international prizes bestowed on persons for excellence in all fields of endeavor.

In a recent study (3), efforts were directed toward identifying what has been labeled as the "generation gap." Over a thousand college students whose ages ranged from 17 to 22, and over 500 persons whose ages ranged from 35 to 65 were asked to "select and rank order the 10 most important persons in the history of mankind." As predicted, the young and not-so-young identified the category of human excellence to be represented by the same persons. Yet,

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the younger group was much more diverse than the not-so-young group in their identification of excellence. Their pool of persons who met the criteria of excellence was much larger and more diverse than the pool identified by the older age group.

The purpose of this investigation was to further refine the technique described, and to establish relationship between it and certain personality dimensions.

In the previous investigation (3), the measure used was frequency count. In other words, if two persons were selected an equal number of times, they received the same frequency score. No attempt was made to consider the relative weight of the rank order. Clearly frequency count *per se* presents a methodological problem. For instance, two persons could have the same frequency count, yet one might be consistently identified as Number 1 and the other as Number 10 in the ranking of the most important persons in the history of mankind. Although the frequency of their selection is the same, the ranked order is quite different. The present investigation considered rank-weighted frequency count, as well as the simpler frequency of occurrence. Furthermore, it was reasoned that an individual's selection of the 10 most important persons is related to his general tendency to conform to his culture's norms and values. Therefore, individuals who are disenchanted with their culture, and who are searching for new "life styles" are more likely to identify as important persons different persons from those who are satisfied with their culture. Specifically, it is suggested that the congruency between an individual's list and the total group's final list is related to the individual's score on Rotter's (6) Internal-External Control Scale (I-E). The I-E Scale was identified to be a sound prediction of conforming behaviors (2, 5, 6).

It was hypothesized by the present investigators that (*a*) there will be positive monotonic relations between frequency and rank-ordered-weighted frequency in the selection of the 10 most important persons in the history of mankind, and (*b*) there will be significant correlation between the congruency score and I-E scores. The more externally oriented the individual is, the more congruent will be his and the group's lists.

B. Methods and Procedures

The study population consisted of 48 university students. The group was composed of 32 females and 16 males. Their mean age was 22.8 years, and standard deviation was 5.9. Of these students, 90% were white, while 10% were black, and the majority came from working-class families as determined by their father's occupations.

Subjects were asked to "list and rank order the 10 most important persons in the history of mankind," and to complete the I-E Scale. The I-E Scale purports to measure an individual's belief in his ability to control his own destiny. The scale is a forced-choice type, comprised of 23 items and six filler items. For example, subjects must choose between these two statements:

1. In the case of the well-prepared student, there is, rarely if ever, such a thing as an unfair test.

2. Many times, exam questions tend to be so unrelated to course work that studying is really useless.

The reliability and validity of the I-E Scale has been reported on diverse populations (4), and it was deemed unnecessary to re-establish it for the study's population.

C. RESULTS AND DISCUSSION

The total number of persons listed by all *S*s once, or more than once, is 136. Each was listed and the frequency within each of the 10 possible ranks was recorded. An important person's rank-weighted frequency was computed as follows: columns from 1 to 10 which represent the ranking were assigned weight values from 1 to .1. The individual rank-weighted frequency of each important person was the sum of products of the frequency within each column the person received times the weight assigned that column. The range of possible relative ranking weight values is from 48 to .10. The range of possible frequency scores is from 48 to 1. Table 1 summarizes the frequency and rank-weighted frequency data for each of the 10 most important persons in the history of mankind based on the responses of the current population.

As can be seen in Table 1, the frequency and rank-weighted frequency dis-

TABLE 1
THE TEN MOST IMPORTANT PERSONS IN THE HISTORY OF MANKIND

Names	Rank	Frequency	Percentage of maximum possible frequency	Rank weighted frequency	Rank of rank-weighted frequency
Jesus Christ	1	33	69	31.9	1
Martin Luther King, Jr.	2	27	56	18.1	2
Karl Marx	3	26	54	15.0	3
Adolph Hitler	4	23	48	11.7	5
John F. Kennedy	5	20	42	11.5	6
Socrates	6	15	31	11.8	4
Plato	7	14	29	11.1	7
Albert Einstein	8	14	29	8.2	8
Abraham Lincoln	9	13	27	7.2	9
Franklin D. Roosevelt	10	13	27	6.3	10

the younger group was much more diverse than the not-so-young group in their identification of excellence. Their pool of persons who met the criteria of excellence was much larger and more diverse than the pool identified by the older age group.

The purpose of this investigation was to further refine the technique described, and to establish relationship between it and certain personality dimensions.

In the previous investigation (3), the measure used was frequency count. In other words, if two persons were selected an equal number of times, they received the same frequency score. No attempt was made to consider the relative weight of the rank order. Clearly frequency count *per se* presents a methodological problem. For instance, two persons could have the same frequency count, yet one might be consistently identified as Number 1 and the other as Number 10 in the ranking of the most important persons in the history of mankind. Although the frequency of their selection is the same, the ranked order is quite different. The present investigation considered rank-weighted frequency count, as well as the simpler frequency of occurrence. Furthermore, it was reasoned that an individual's selection of the 10 most important persons is related to his general tendency to conform to his culture's norms and values. Therefore, individuals who are disenchanted with their culture, and who are searching for new "life styles" are more likely to identify as important persons different persons from those who are satisfied with their culture. Specifically, it is suggested that the congruency between an individual's list and the total group's final list is related to the individual's score on Rotter's (6) Internal-External Control Scale (I-E). The I-E Scale was identified to be a sound prediction of conforming behaviors (2, 5, 6).

It was hypothesized by the present investigators that (*a*) there will be positive monotonic relations between frequency and rank-ordered-weighted frequency in the selection of the 10 most important persons in the history of mankind, and (*b*) there will be significant correlation between the congruency score and I-E scores. The more externally oriented the individual is, the more congruent will be his and the group's lists.

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tributions are very similar. There was only one discrepancy in ordering between these two distributions. Socrates' frequency ranking is six, while his rank-weighted frequency places him in fourth position. It should be noted that the 15 individuals who selected Socrates tended to place him at higher rank than the 23 and 20 individuals who selected Adolph Hitler and John F. Kennedy respectively. Furthermore, the utility of employing rank-weighted frequencies is clearly demonstrated in the case of frequency count ties. Plato and Albert Einstein, as well as Abraham Lincoln and Franklin Roosevelt, present tie situations with frequency counts of 14 and 13 for the respective pairs. Plato's rank-weighted frequency clearly outweighs Albert Einstein's, and Abraham Lincoln's outweighs Franklin Roosevelt's.

Conformity score was established by counting the number of persons selected by the *S*s who appeared on the list of the 10 most important persons in the history of mankind. The range of conformity scores was from 7 to zero, with a mean of 3.9 and standard deviation of 1.6. The I-E scores ranged from 19 to 2 with a mean of 12.5 and standard deviation of 3.6. The correlation coefficient between conformity scores and I-E scores is $r = .418$. A test of significance, using Fisher's r to z transformation, indicates that the result is significant with $p < .013$. The more external the individual, the more likely he is to select persons who appear on the group's list of the 10 most important persons in the history of mankind.

The significant correlation between I-E and conformity scores in this investigation reaffirm some previously identified relationships between conformity and external orientation. Yet, the relationship between conformity in selecting important persons and I-E disposition transcend the obvious.

The findings strongly suggest that certain personality variables play an important role in an individual's selection of important persons. These personality variables, and the personality theory which most parsimoniously explains these observations should be the topic of future research. Based on available data, it is possible to suggest that categorization of human excellence is a sensitive intersection point reflecting both culture and personality, and the subject should be investigated by social science.

D. SUMMARY

Categorization, one of man's survival mechanisms, enables him to respond efficiently to his natural and man-made environments. Western civilization places great importance on the category of human excellence. The purpose of this investigation was to identify the relationship between individual selection

of important persons and conformity, and to identify the relationship between frequency of selection and rank order weight frequency.

Forty-eight undergraduate students were asked to "list and rank order the 10 most important persons in the history of mankind," and to complete the Internal-External Control Scale (I-E). Significant correlation between I-E scores and congruency with the group's combined list of 10 important persons suggest that conformity is an important factor in the selection of important persons. Furthermore, it is strongly suggested that the technique used is a sensitive intersection point between cultural and personality variables. The similarity in ranking between the frequency ranking and the rank-weighted frequency provided further evidence that the technique employed is reliable. The specific personality theory and variables which account for the observed phenomena is subject matter of future research.

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NOTE ON THE RELATIONSHIP OF ORDINAL POSITION, DOGMATISM, AND PERSONAL SEXUAL ATTITUDES*

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BLAIR SWANSON

Kilpatrick and Cauthen (1) recently published an article examining the relationship between ordinal position, dogmatism, and personal sexual at-

TABLE 1

COMPARISONS BETWEEN MEANS FOR MALES ON SLS

(Newmann-Keuls)

	MEANS			
	A	B	C	D
	22.35	23.53	24.09	25.53
22.35		1.18	1.74	3.18 *
23.53			.56	2.00
24.09				1.44

$S_x = .85$

* $p < .05$

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titudes. After performing analyses of variance and comparing group means by the Duncan multiple range procedure, the authors concluded that both personal sexual attitudes (SLS) and dogmatism (as measured by form E of the Rokeach Dogmatism Scale) were significantly related to ordinal position. Results of the group mean comparison followed. For SLS scores (*a*) last-born females had significantly higher means than first-born females. For dogmatism (*b*) last-born males had significantly higher mean D scores than all other groups. Kilpatrick and Cauthen's (1) study implied a general re-evaluation of research on authoritarianism and dogmatism.

In an article published in 1969, Petrinovich and Hardyck (2) examined the assumptions, types of errors and error rates, and the choice of different methods to compare group means. The methods included: Scheffé, Tukey A, Tukey B, Newmann-Keuls, Duncan, and two versions of Student's *t*-test. Following a sampling method described in the article, the authors concluded that the frequency of Type 1 errors in the Duncan method far exceeded

TABLE 2

COMPARISONS BETWEEN MEANS FOR FEMALES ON DOGMATISM

(Newmann-Keuls)

	MEANS			
	D 145.06	A 156.89	B 186.64	C 160.45
145.06		11.80 *	13.85 *	15.39 *
156.86			1.78	3.59
158.64				1.81

$S_x = 3.8$

* p < .05

acceptable standards. In short the Duncan multiple range procedure was found unsuitable. Further criticism of Duncan's method is found in Winer (4) and Scheffé (3).

The Newmann-Keuls technique maintains an equal alpha level in comparing several group means. Although notwithstanding some criticism (2), this procedure was used to compare the means found by Kilpatrick and Cauthen. Based on this technique, of the seven significant differences found by the original authors, four still were significant using Newmann-Keuls. Specifically (*a*) last-born males had higher mean scores on SLS than only-born and (*b*) last-born females were higher than the three other groups on D scores.

The above analyses indicate that it is advisable to recognize specific statistical tools. Contradictory results may be explained partially by lack of such recognition, or perhaps a desire for "significance." Thus, if convergence of birth order data is desirable, appropriate methods should be used. There is no question that some conclusions are a function of the methodological procedure followed by the experimenter.

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PREJUDICE AND ADJUSTMENT TO CULTURAL NORMS AMONG ENGLISH-SPEAKING SOUTH AFRICANS*

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It has been argued (3) that the relationship between prejudice and personality is largely a function of whether the prevailing cultural norms explicitly sanction prejudiced ideas. In the case of cultural settings where prejudiced norms prevail, individuals will be encouraged to hold attitudes of intolerance irrespective of their basic personality structure.

A previous study (4) with persons reared in the relatively "prejudiced" climate of White South Africa found insignificant correlations between the F-Scale measure of personality and two measures of prejudice, supporting the above argument. Since (*a*) the subjects were exposed to "prejudiced" norms and (*b*) personality factors (e.g., authoritarianism) do not seem to play a crucial role in the development of prejudice in this setting—as suggested by the insignificant correlations between the F-Scale and the two prejudice-scales —it is likely that "conformity to cultural norms" is the major determinant of their intolerant attitudes.

To test this possibility 101 White English-speaking South African high school students (average age, 16) were given two measures of prejudice and two measures of the extent to which they were "conforming to cultural norms." The scales consisted of (*a*) a 12-item measure of anti-African prejudice (PR) developed according to the scale-discrimination technique of Edwards and Kilpatrick (2) from actual statements made by White South Africans about Africans in an informal group session, which is relatively high as regards unidimensionality (rep. = .86) and discriminating power (phi = .65), and (*b*) the 18-item measure of Anti-Africanism (AA) developed by Pettigrew (5) in a previous study with English-speaking South Africans. The two indicators of "conformity to cultural norms" were, at the more personal level, (*a*) the 16-item social conformity scale (SC), developed by Pettigrew (5) and used by him with English-speaking South Africans and, at the more social level, (*b*) a "South Africanism" scale (SA) tapping agreement with statements reflecting typical South African values in a variety of areas. This

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scale was developed from an initial pool of 50 items rated by a group of 10 judges on a five-point scale in terms of the degree to which they represent traditional South African views. Only those items which received mean scale values greater than 4.0 (i.e., were regarded by most judges as indicating "very typical" South African views) were retained. These 16 items were then given to two criterion groups, consisting of 50 South African-reared adults (average age, 23) who had undergone military training and 50 European-reared adults (average age, 24) who had not undergone military training. When they expressed their agreement with the item-statements on a six-point scale the difference between their mean scores on each of the items was significant beyond the .01 level.

If cultural factors are crucial, as suggested, then there should be a positive relationship between the two measures of prejudice and adherence to typical South African values. This was borne out, with the following correlations being obtained: SA and AA, $r = .53$ ($p < .01$); SA and PR, $r = .50$ ($p < .01$). In addition, since the subjects have been reared in a setting characterized by "prejudiced" norms (1, 6) there should be a positive relationship between prejudice and proneness to conform to group norms. This was also established, with the following correlations being obtained: SC and AA, $r = .61$ ($p < .01$); SC and PR, $r = .58$ ($p < .01$). As predicted there was also a significantly positive correlation between the two measures of prejudice (AA and PR, $r = .76$, $p < .01$) and between the measures of "South Africanism" and social conformity. (SA and SC $r = .45$, $p < .01$). If one assumes the sample is fairly representative and the measures are valid, these results point to the crucial role of the cultural milieu in shaping the attitudes of White South Africans toward the Africans in their midst.

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EFFECT OF KNOWLEDGE OF OBJECTIVES ON VISUALIZED INSTRUCTION*

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A. INTRODUCTION

The process of informing *S*s of the specific objectives of an instructional unit is becoming a common instructional technique. The rationale of such a procedure is to focus *S*'s attention on the important aspects of the instruction by telling them specifically the types of information they will need to obtain in order to achieve successfully on specific criterial measures.

Although previous research (1, 2) has investigated the use of various types of visual illustrations used to complement programed instruction, there is no experimental evidence regarding the effectiveness of visualized programed instruction when *S*s, prior to receiving their instructional unit, receive specific instructions focusing their attention on the learning objectives of the unit. Thus, the purpose of this study was to determine which type of visual illustration complementing programed instruction was most effective in promoting *S*'s achievement on five criterial measures when *S*s were told specifically the types of information they should obtain from the instruction.

B. METHOD

1. *Treatment Groups*

Two hundred fifty-nine students at The Pennsylvania State University were randomly assigned to one of the nine treatment groups. *S*s in each treatment received their instruction via programed booklets consisting of 37 paragraph-type frames on 8½-inch by 5½-inch sheets; each frame contained a 2½-inch by 3½-inch plate designed to complement the programed instruction. Material concerning the human heart was selected because it permitted the evaluation of several learning objectives.

Information transmitted via the verbally programed channel was held constant for each presentation and the amount of realistic detail contained within the visual illustrations was varied. Students in Group I received no visual

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illustrations but viewed printed words; Group II viewed abstract line illustrations (B & W); Group III viewed abstract line illustrations (Colored); Group IV viewed detailed, shaded drawings (B & W); Group V viewed detailed, shaded drawings (Colored); Group VI viewed photographs of a heart model (B & W); Group VII viewed photographs of a heart model (Colored); Group VIII viewed realistic heart photographs (B & W); and Group IX viewed realistic heart photographs (Colored). *S*s were asked to indicate on the booklet the amount of time it took them to complete their instruction.

2. *Procedure and Criterial Measures*

Each *S* in each treatment group received the Otis Quick Scoring Mental Ability Test (Form Fm) as a pretest, participated in his respective instructional presentation, and then received four individual criterial.

Prior to receiving the instructional booklets, *S*s were told the type of learning that each test that they would receive was designed to measure and the type of information they would need to obtain from the instruction in order to perform successfully on the tests. Scores received on these tests were combined into a 78-item total criterial test. The objective of each test was as follows: (*a*) drawing test—to evaluate learning of specific locations of the various patterns, structures, and positions of the parts of the heart; (*b*) identification test—to measure the *S*s ability to identify numbered parts of a diagram of the heart from information presented via the instructional presentation; (*c*) terminology test—to evaluate knowledge of referents for specific symbols; (*d*) comprehension test—to measure understanding of the heart, its parts, and its internal operations, and (*e*) the total criterial test—to measure the *S*s total understanding of the concepts presented. The Kuder-Richardson Formula 20 reliability coefficients for the five criterial measures were (*a*) drawing .73; (*b*) identification .79; (*c*) terminology .67; (*d*) comprehension .80; and (*e*) total criterial .91.

C. RESULTS

An analysis of variance was conducted on the *IQ* scores *S*s achieved on the Otis Quick Scoring Mental Ability Test and on the amount of time *S*s in the respective treatment groups needed to proceed through their instructional unit. In no case did the observed values reach the critical value for a .05 level test. An analysis of variance yielded significant *F* ratios on the drawing ($F = 2.22$, $df = 8/250$, $p < .05$) and identification tests ($F = 3.30$, $df = 8/250$, $p < .01$). Tukey's W-Procedure (3) was used to analyze differences between pairs of means. The analysis indicated that in terms of economy of production and instructional effectiveness the simple line presentation (B & W) was most efficient in promoting *S* achievement on the drawing ($II > I, W = 3.13$. $n/v = 9/259$, $p < .05$) and identification tests ($II > I$, $W = 3.58$, $n/v = 9/259$, $p < .01$).

D. DISCUSSION

The results indicate that *S*s who received the simple line illustrations complementing the programed instruction achieved significantly higher scores on the drawing and identification tests than did *S*s who received the programed presentation without visuals of the heart. The success of the simple line illustrations may be attributed to the fact that *S*s could readily identify the relevant instructional cues in the visual and learn from them. It may be that even though the *S*s knew the type of information to look for in the realistic illustrations, the additional detail they contained may have had the tendency to distract attention from the essential learning cues. The failure of the visually complemented treatments to facilitate achievement on the terminology, comprehension, and total criterial tests may indicate that the achievement of educational objectives of the type measured by these tests does not require *S*s to utilize visualized information.

E. SUMMARY

The results of this study indicate that when visuals are used to complement programed instruction (*a*) all types of visuals are not equally effective in facilitating *S* achievement of different learning objectives, and (*b*) the use of specific instructions to focus *S*s' attention on relevant learning cues in the more realistic illustrations is not an effective instructional technique for increasing *S*s' achievement.

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DIVERGENT THINKING, REMOTE ASSOCIATIONS, AND CONCEPT ATTAINMENT STRATEGIES*

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A. INTRODUCTION

Bruner, Goodnow, and Austin (1) have described the nature of certain concept attainment tasks in terms of systematic sequences of hypotheses and decisions rather than as specific, single responses. These sequences have been termed by Bruner *et al.* as strategies. Four major strategies have been delineated: *simultaneous scanning,* in which subjects approach the task of concept attainment by generating and evaluating all possible hypotheses at the same time as each new piece of information is presented; *successive scanning,* in which subjects follow a single hypothesis at a time and examine each new piece of information only in terms of that hypothesis; *conservative focusing,* in which subjects deal not with a specific hypothesis but rather with constraints on the feature that a correct hypothesis would have to take into account; and *focus gambling,* which is similar to conservative focusing except that subjects take high risks by varying more than one attribute at the time. Bruner *et al.* feel that simultaneous scanning is an exacting process placing emphasis on memory; successive scanning relieves cognitive strain but is likely to involve redundancy of cues; conservative focusing is relatively economical in that each cue selected is informative; while focus gambling maximizes cues when correct, but involves higher risks.

There have been numerous attempts to relate concept attainment proficiency to personality variables, such as anxiety (2), open-and closed-mindedness (4) and self-concept (3). However, there has been little examination of the relationship of concept attainment strategy to the important variable of *creativity.* Some oblique references might be applicable, however—such as Walkup's (9) hypothesis that creative people have a high ability to visualize, remember, and manipulate data in certain areas and Zinchenko's (10) discussion of the relationship between creativity, perception, and memory.

Other research is not altogether clear. Laughlin (5) and Laughlin, Doherty,

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and Dunn (6) investigated concept formation in light of creativity and intelligence. The results of the latter study are extremely ambiguous, if not directly contradictory. They procedurally defined creativity by measures obtained on the *Remote Associates Test (RAT),* and likewise, intelligence by scores derived from the SRA High School Placement test. After testing over 600 subjects Laughlin *et al.* suggest that creativity is a more sensitive predictor than intelligence for incidental concept formation, and, that intelligence is a more sensitive predictor than creativity for intentional concept formation. These suggestions are practically meaningless in light of the .41 correlation coefficient which Laughlin reported for SRA with RAT measures. Indeed, there is nothing in his research reports indicating a significant difference between the creativity and intelligence variables as he had preassumed.

The literature does not provide answers as to whether people who employ certain types of strategies will be better divergent thinkers than those who employ other strategies. Since the processes Bruner *et al.* (1) delineate for simultaneous scanning and focus gambling are similar to those associated with divergent thinking, it was hypothesized that those strategies would be associated with a higher level of divergent thinking than the more conservative strategies of successive scanning and conservative focusing. It was also hypothesized that divergent thinking would not be related to ability to produce remote associations where there is a single correct response, as in Mednick and Mednick's *Remote Associates Test (RAT)* (7).

B. METHOD

1. *Subjects*

The *S*s were 109 University of Georgia undergraduates enrolled in the introductory course in educational psychology. The *S*s included 28 males and 81 females, all English speaking Caucasians of American parentage and birth with no unusual physical defects. The mean age of the *S*s was 20.51 years and an undergraduate class level mean of junior.

2. *Instruments*

The classification of the subjects according to concept attainment strategy was accomplished through the use of a modified form of the concept attainment task described in detail by Bruner *et al.* (1). Only three of the problems were presented to each subject.

Divergent thinking was assessed by means of Figural Form A of the *Torrance Tests of Creative Thinking* (8). This battery consists of the picture construction, picture completion, and repeated figures tasks and yields scores on fluency, flexibility, originality, and elaboration. Interscorer reliabilities in this study were in the high .90's. Reported test-retest reliabilities for alternate forms of the figural tests range from .60 to .85 for subtest scores. Rather extensive validity data are reviewed in the norms-technical manual (8).

The *Remote Associates Test* (7) is commonly used to assess ability to think creatively among college students. The *S* is required to produce within a 40-minute period for each of 30 items a single association that is relevant to each of three words. The score is the number of correct associations produced by the *S* within the time limit. The authors report odd-even reliability coefficients of .91 and .92 for Form I used in the present study and an alternate form reliability coefficient of .81. The validity data are reviewed in the examiner's manual (7).

3. *Data Collection*

Data were collected over a period of one month (May, 1969). The Bruner Strategy Tasks (BST) was administered as an individual test by a team of three carefully trained *E*s, advanced graduate students in educational psychology.

Each *S* was given one warm-up trial in order to communicate his understanding of the objective of the task at hand. Three separate trials were then administered to each *S* and the *S*'s reason for each choice was recorded by the *E*. After each choice by the *S*, the *E* provided a positive or negative feedback in agreement with rules of the task administration. At any time during the task trial procedure the *S* had the option of guessing the unknown conjunctive concept which the *E* had in mind (written on the back of each focus card). Once the option had been exercised the trial automatically came to direct closure and further choosing and guessing were not permitted. Thus the trial ended and a new one began until three such trials had been undertaken.

The strategy classification for each of the *S*'s three trials was determined by the protocols governing the four possible strategy types as listed by Bruner *et al.* (1). The *S* was then categorized as a Type I strategist (all *S*s characterized as sussessive scanners and/or conservative focusers) or a Type II strategist (all *S*s characterized as simultaneous scanners and focus gamblers) by two or more of the three trial classifications which were similar or belonged to the same strategy type. Thus, each *S*'s BST score was recorded as either Type I or Type II of the dichotomous variable "strategy."

The *Remote Associates Test* (RAT) was administered in groups to each of the four participating classes by the instructor of each respective class. Each instructor had been individually oriented to the group administration procedures of the RAT by the authors. All Remote Associates Tests were scored by the use of the standard scoring key.

Figural Form A of the *Torrance Tests of Creative Thinking* (TTCT) was administered to each of the four classes by the instructor of each respective class. The first author scored all Figural Form A tests by use of the standard scoring manual. The four scores of fluency, flexibility, originality, and elaboration were obtained and transformed to T scores and summed into a composite score representing the total creative or divergent thinking output of the individual.

C. RESULTS

Since a heterogeneous sample of 28 males and 81 females were examined, the possibility of sex disproportionality and significance were precluded by chi square and simple ANOVA comparisons. Sex was found to be nonsignificant as reflected in an *F* value.

The data were then analyzed by a factorial design in which two levels of two independent variables were viewed. Remote associative ability as measured by scores on the RAT, and concept attainment strategy type as measured by the BST, were the independent variables. The dependent variable was divergent thinking ability as measured by scores on the TTCT (Figural Form A). High and low levels were defined by a mean split on the total scores of the RAT.

The means and standard deviations on Figural Form A of the *Torrance Tests of Creative Thinking* are presented in Table 1 according to strategy type and level on the RAT.

TABLE 1
MEANS AND STANDARD DEVIATIONS ON THE TORRANCE TESTS OF CREATIVE THINKING (FIGURAL FORM A) FOR TWO STRATEGY TYPES AND TWO LEVELS ON THE REMOTE ASSOCIATES TEST

		Strategy	
		Type I	Type II
RAT	High	$\overline{X} = 232.61$ $SD = 18.21$ $N = 21$	$\overline{X} = 183.73$ $SD = 24.24$ $N = 34$
	Low	$\overline{X} = 224.19$ $SD = 33.60$ $N = 21$	$\overline{X} = 183.60$ $SD = 21.83$ $N = 33$

*S*s classified as Type I strategists have higher scores than those classified as Type II strategists regardless of their level on the RAT.

The results of the 2 × 2 analysis of variance are presented in Table 2 for each main effect and the interaction. The *F*-value for strategy type is significant at better than the .01 level. However, the *F*-value for RAT level is nonsignificant. The interaction is also nonsignificant.

The authors recognized the possibility that a high relationship between scores on the RAT and the TTCT might generate an increase in the main effects. Rather than use the high and low subgroups in a tetrachoric correlation, the authors avoided the weakness of small *N*s and used the total sample. A product-moment coefficient of correlation of .05 was obtained between scores on the TTCT and the RAT. The coefficient strengthens the findings concerning main effects.

TABLE 2
ANALYSIS OF VARIANCE DATA FOR THE TWO BY TWO FACTORIAL DESIGN

Source	*df*	*SS*	*MS*	*F*
Strategy	1	51660.18	51660.18	84.91
RAT	1	247.00	247.00	.40
Strategy × RAT	1	499.22	499.22	.82
Within	105	63880.70	608.38	

D. DISCUSSION

The findings reported herein support the hypothesis that focus gambling and simultaneous scanning, as defined by Bruner and his associates, are the favored strategies of the creative thinker and are useful in cognitive problem solving and decision making. Although the RAT was designed originally as a measure of creative thinking, the high correlations it provides with intelligence test scores suggest its predictive qualities to be those of convergent thinking. As seen here, there is no significant relationship between divergent thinking ability as measured by Figural Form A of the TTCT and RAT measures. Furthermore, there seems to be little relationship between strategy type and level of performance on the RAT.

The studies cited herein have dealt almost exclusively with concept formation as a given resultant of experimentation, whereas the present study examines the *process* or *approach* to this given capacity to form concepts. However, studies of a similar nature should be done with the verbal form of the TTCT. It is possible that verbal measures of divergent thinking may not be associated with concept attainment strategy. If concept attainment strategy is not bound to figural stimuli, however, we would expect the relationship to hold.

E. SUMMARY

The purpose of this experiment was to explore the roles which concept attainment strategy types and remote associative abilities play in divergent thinking among college students. It was hypothesized that high risk concept attainment strategies (simultaneous scanning and focus gambling) will be associated with a higher level of divergent thinking than will the low risk conservative strategies (successive scanning and conservative focusing) and that ability to produce correct remote associations will not be associated with divergent thinking ability. The *S*s were 109 randomly assigned college undergraduates. Divergent thinking was measured by Figural Form A of the *Torrance Tests of Creative Thinking;* concept attainment strategy type, by Bruner's Strategy Tasks; and ability to produce correct remote associations, by Mednick and Mednick's *Remote Associates Test.* The hypotheses were supported by the findings.

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CHANGES IN SEXUAL IDENTIFICATION AND ROLE OVER A DECADE AND THEIR IMPLICATIONS* † [1]

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A. INTRODUCTION

As a final comment upon his evaluation of recent literature dealing with the psychology of masculinity and feminity, Bieliauskas (2, p. 262) writes: "For a man to be a man, and for a woman to be a woman is what one is supposed to be. Philosophically speaking, it is good for a being to be what he is supposed to be. Therefore, for a *man* to be *masculine* and for a *woman* to be *feminine* is what makes each an authentic human being, and enhances the maturity and the richness of personality." While this statement might be incontrovertible from a philosophical standpoint, and while conservative psychologists may regard it as a consummation devoutly to be wished, anthropological and sociological studies have offered abundant evidence of the diverse ways in which sex typing occurs in various cultures. As early as 1955 Kardiner (8) perhaps anticipating the so-called "sexual revolution," made some incisive comments upon the rise of feminism which has now culminated in the "Woman's Liberation Movement" and upon the flight from masculinity which he equated with a dismaying increase in the incidence of homosexuality. Anyone with an historical perspective is familiar with the changes that have been rung upon the theme of masculinity and deviations from the existing stereotype, ranging from Cicero's scathing comments upon the mincing effeminacy of young Roman aristocrats in his Oration Against Cataline to Ashley Montagu's (13) views on the increasing feminization of men and the concomitant masculinization of women.

Current manifestations of sexual role unrest and diffuseness contradict the validity of anyone's cherished belief in the stability and inherent rightness of

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[1] I am grateful to Mr. Melvin Sinowitz of the Division of Psychology, The Mount Sinai Hospital, for tabulating the clinic cases and performing the statistical computations on them, and to Dr. Rebecca Snyder of the East Orange New Jersey Veterans Hospital for providing me with the V.A. population and statistical results.

the sanctioned stereotype. Of course, a second look at any social stereotype will quickly disclose its speciousness, but the problem of sexual identity, identification, and role offers a special challenge to the clinical psychologist, psychiatrist, and sociologist because of its intimate involvement with so many other facets of self-realization, affectivity, and human relationships.

From a phenomenological standpoint we may consider the variously rationalized attitudes of those who advocate dropping out from the masculine-competitive "establishment" trap; the woman in the pants suit who would have been regarded as a transvestite in another era; the hermaphroditic image of the girlishly tressed and bearded youth (carbon copies, incidentally, of Albrecht Durer's, 1471-1528, "Self-Portrait as a Young Man"); the concepts of "unisex" and "onelookmanship"; the ubiquitousness of the miniskirted child-woman; the medallioned and beaded male; and the more extreme sartorial extravagances of the hippies. These are only a few of the overt symptoms of deep-seated role dissatisfactions currently conspicuous in western civilization but by no means confined to it.

Helena Deutsch (4, pp. 79-80) comments upon the striving on the part of young people for sexual identity between boys and girls and their intention to obliterate the external differences between the sexes. She attributes this to the adolescent's fear of death and writes: "Double-sexed unity is the way to achieve bi-sexuality and, with it, the ultimate goal of immortality. The grotesque denial of sex differences is an expression of the boy's own feminine fantasies, by projection onto an external object and, at the same time, an identification with this object, in a kind of mirror-twin fantasy. It is like a realization of the myth of Narcissus who, upon looking into the mirror of river water, sees the image of his twin sister. The boy's fear of women is conquered by his making the girl into a boy, while, on the other hand, homosexuality is ruled out by the actual sex of his love partner ('she is my chick'). She further comments upon the relevance of the bisexual fantasy to the bearded man with long hair who is projecting the desire to be both woman and man and who proclaims through his appearance that he has no need for society "because I am both man and woman in myself." She discounts the explanatory value of similar appearances of men in previous ages on the assumption that cultural manifestations in any era do not negate psychodynamic interpretations.

The reference to bisexuality touches upon the problem of homosexuality, its postulated increase in western society, and a trend toward a more tolerant attitude toward it on the part of educated people. Apart from the fact that personalized and emotionalized attitudes introduce a confounding factor into one's conception of the nature of homosexuality, ranging from the partisan view that it is a "third sex" departure from the stereotyped norm to the conclusion that it represents a pathological deviation from an established biopsychological foundation, it cannot be denied that the heterosexually oriented view it with distaste at the very least.

The psychodiagnostician who works with projective techniques and especially with the Rorschach must know that this technique provides more than a picture of individual psychodynamics. Twenty-six years experience with it has convinced me that it serves as a unique mirror of the culture and therefore lends itself to a study of changes occurring within the culture. Psychodiagnosticians are familiar with the space capsule (Card II) and the departing space ship on the same card; the delta wing plane (Card V and Card VIII); the atomic explosion on Card IX, and the psychedelic strobe show and Peter Max art on Card X. Other images from fairy tale, myth, and folklore are also plentiful as manifestations of the persistence of magical beliefs in this age of technological sophistication.

Rorschach data that have specific relevance to problems of sexual identification and role pertain to responses elicited by Cards III and VII, both of which purportedly are heavily loaded with human content; Card III traditionally facilitating a masculine response and Card VII a feminine one. The implications of responses to these cards, and especially to Card III, have been stressed unambiguously in the literature and serve as guide points for content interpretations. Schafer (18, p. 135) writes that when the popular figure on Card III is seen as a woman or bisexual or when the symmetrical figures are seen as one man and one woman this indicates "fear of and a rejecting attitude toward masculine identification; feminine identification in men," and when reversal, combining, blurring, or arbitrary assignment of sex characteristics occur in the case of women the same conclusions can be drawn with regard to fear and rejection of a feminine identification and concomitant masculine identification in women. In his presentation of a case Schafer (19) marks as "homoerotic" a patient's response of two women to Card III. Lindner (12, p. 82) writes that ". . . homosexuals, of whatever type, seem to be troubled by this feature (breast-like extension) and show hesitation regarding the sex of the figure," and further, "Such persons tend to solve the problem by stressing the femininity of the projected image as "it must be a couple of women." Rapaport, Gill, and Schafer (16, p. 349) comment that "one other type of queer verbalization may be mentioned, that in which two symmetrical figures are described as male and female," and they add in a footnote, "like any other pathological response, this male-female response carries the implication of a true "projection" and in our experience has usually been an indication of strong homosexual strivings." Klopfer, Ainsworth, Klopfer, and Holt (10) referring to Card III declare that "Being unable to see the human figures in this area altogether is so unusual as to lead to the hypothesis that the perceiving subject is unable to accept or identify with others" p. 322. They add: "Various difficulties in the identification and acceptance of a sexual role may be indicated by such details as not specifying the sex of the figures, referring to the two symmetrical figures as being of different sexes, or attributing both male and female characteristics to the same figure" (p. 392). They also say concerning Card VII, "A general tendency to see only infantile or animal objects, especially when a positive affect is associated with them, may be indicative of an immature level of social development. Such a person can express affect only towards lesser or toy-like objects but cannot tackle adult heterosexual relations with any expectancy of success" (p. 396). Due and Wright (5) report that the male homosexuals project both genders onto the same area or homologous areas of the blot and exhibit significant uncertainty, evasiveness, and confusion with regard to gender identification on Card III. When gender designation is unequivocal it is predominantly feminine in character for homosexuals. Bergman (1) reports that homosexuals most consistently exhibit doubt as to the sex of the human figures seen and do not perceive men or women and Phillips and Smith (15, p. 140) state that the identification of a human percept as feminine (on Card III) is a female characteristic, commenting in a footnote that "both men and women . . . tend to develop more male figures than they do female." Upon the basis of her study of 43 male college students (9 homosexuals, 10 neurotics, and 24 normals) Fein (6) reports that among other indices the perception of men with feminine attributes and of male and female figures in symmetrical blot areas are homosexual indicators. Lindner (12), Wheeler (20) and Nelson, Wolfson, and LoCascio (14) agree that Card III, regardless of the sex of the respondent, elicits more responses of males than of females. It should be noted that most of these references refer to interpretations that were current prior to 1950 and which still influence Rorschach interpretations.

On the other side of the fence some studies have failed to support specific assumptions concerning Card III. Wheeler (20) concluded upon the basis of a comprehensive study of homosexuality that while 14 internally consistent Rorschach signs agreed with the therapeutic judgment and other criteria, the two signs that were of very questionable differentiating usefulness were humans seen with the sexual specification confused and humans with uncertain sexual specification on Card III. The perception of females on Card VII "with derogatory specification" was included in the list of 14 positive signs. In a more recent study DeLuca (3) compared 42 overt male homosexuals with 25 normals, utilizing Wheeler's signs and reported that "no individual sign was able to differentiate, beyond the .05 level, between the homosexuals as a whole and the normals, or any other pair of groups" (subgroups according to the behavioral expression of homosexuality). With specific relevance to the present study, Hammer (7, pp. 61-62), upon the basis of his Rorschach study of 91 clinic patients (36 males and 55 females) and 95 normals (48 males and 47 females) concluded that "results strongly suggest that when a female reports seeing *males* (italics mine) or no humans at all on Rorschach Card III, the likelihood is great that she is suffering from some form of emotional disturbance." He further writes: ". . . it appears to be the norm for non-clinic males to see females on this card. This would make suspect the assumption that Card III is an index of sexual identification for males unless the reader is prepared to say that most males, especially college students, tend to be femininely identified." Thirty percent of the male patients saw females on this card in contrast to 52 percent of male normals who did so, and only 7 percent of female patients saw females as against 47 percent seen by female normals. This unanticipated finding runs diametrically counter to implicit base rates postulated by earlier psychodiagnosticians and is consonant with findings to be reported in this paper. It is noteworthy that a tabulation of Rorschach's (17) 27 cases (12 females, average age 42.9, and 15 males, average age 38.1) shows that 44 percent saw males on Card III (none saw females) and 67 percent saw no humans on Card VII. While the number of cases is very small, the specificity of gender designation is evident. Rorschach made no references to sexual identification or homosexuality in his work.

B. METHOD

1. *Subjects*

Three separate patient populations were used in this study. The first consisted of 884 private patients referred for psychological examinations and examined by the author. This primary group, designated Group A, comprised 400 patients, 215 males and 185 females who were seen in 1954 and 1955 and labelled Group II; and 484 patients, 273 males and 211 females, labelled Group I.

The second population consisted of 370 hospitalized and clinic psychiatric patients from The Mount Sinai Institute of Psychiatry and designated as Group B. This group was divided into two sets, the first, labelled Group III comprised 82 males and 103 females examined from 1949 to 1951, and a second group, Group IV, 82 males and 103 females, examined from 1960 to 1963 inclusive.

The third consisted of 139 patients from the medical service of the East Orange New Jersey Veterans Administration Hospital. In this group, designated Group C, 61 were examined between 1956 and 1959 and 78 from 1960 to 1967 inclusive. The patients in this group ranged in age from 20 to 39 exclusive of 3 aged 19. This group had been utilized in a study of psychosomatic disease and included 39 with duodenal and peptic ulcer, 20 with ulcerative colitis, and 4 with asthma. For the purpose of this study Group C may be regarded as a control group.

2. *Hypotheses*

Over a period of several years I had observed that more patients referred for psychodiagnostic evaluations were seeing females on Card III than would have been expected upon the basis of previous implicit base rates established clinically. Against the background of social phenomena discussed previously and in order to subject my impression that there had been a significant reversal of the sex of figures seen on Card III in recent times to experimental verification it was hypothesized that

1. Male private patients examined in 1954 and 1955 and clinic patients examined from 1949 to 1951 (early groups) will see more male figures on Card III than patients examined in 1965-1967 and 1960-1963 (later groups).

Upon the assumption that female patients would tend to feminize the male and simultaneously to incorporate masculine attributes for themselves in recent times and in contrast to better role stabilization in an earlier period it was hypothesized that

2. The earlier female private and clinic patients of Group II (1954, 1955 and 1949-1951) will see more males on Card III than will female patients of the later group (1965-1967 and 1960-1963).

Pursuant to the assumption that a younger generation of patients would be more sensitively responsive to and involved with social-cultural influences affecting sexual identification and role than an older and presumably more stabilized population, it was hypothesized that

3. Younger private patients between the ages of 16 and 25 will see more females on Card III than will patients over the age of 40 years. Conversely, older patients will see more males on Card III than will younger patients. These differences will be less pronounced in the earlier group and more so in the later group.

Based upon the assumption that Card VII taps feelings and attitudes toward femininity it was hypothesized that

4. Male and female private patients of the later group (1) will project

more gender blurring and devaluative attitudes on Card VII (quasi-human and mythical figures) than will patients in the earlier group (II).

Upon the assumption that the Rorschach should reflect increasing interpersonal alienation in an urban private patient population it was hypothesized that

5. Male and female later group (I) private patients will be more inclined to see no humans on Cards III and VII than will earlier private patients of group (II).

Upon the assumption that the human need for contact, affection, and dependency inclusive of and beyond sexual relationships tends to remain constant within the patient population and that this factor is tapped by Card VI it was postulated that

6. There will be no difference between the earlier and later groups with regard to the perception of an animal pelt on Card VI.

Upon the assumption that affective and attitudinal sets toward humans tend to be generalized, it was hypothesized that

7. There will be a significant relationship between a response to Card III and one to Card VII.

Finally, assuming that deviant combinations of responses to Cards III and VII in the same protocol will differentiate the groups it was hypothesized

8. The incidence of deviant combinations of responses to Cards III and VII will be significantly greater in the later group (I) than in the early group.

3. *Procedure*

All cases were selected at random from private and hospital files and were tabulated for the type of response given to Cards III, VI, and VII of the Rorschach. No comment was made whenever gender was given spontaneously ("These are two men talking to each other"; "Two people tearing something apart, they're women"). If the response was "people," "persons," "figures," "characters," or otherwise human but without gender designation the patient was asked, "What is their sex?" or "What is their gender?" (but not "Are they male or female?"). The response to this question was accepted as if it had been given spontaneously. All responses were classified under the following headings: M: Unambiguously male; F: Unambiguously female; (H): Quasi-human and mythical (gnome, elf, cherub, cartoon characters, nymphs, dolls, genii, devils, humanized animals, etc.); M & F: Symmetrical figures seen as one man and one woman; MF: Bisexual or hermaphroditic figures (men with breasts, women with penises; Neutr: Essentially "neither" responses; Ho: No human figures perceived.

Table 1 shows the numbers and percentages of private later (I) and earlier (II) patients who responded under the above headings for Cards III and VII. In addition to showing the relationship between a response on Card III and one on Card VII, this table provides a normative baseline for assessing the typicality of any of the combinations listed. It is interesting to note the rarity with which certain combinations occur in this private psychiatric population.

Inspection of Table 2 shows quite clearly that there has been a significant increase in the number of younger males referred for psychological evaluations and a concomitant decrease in the number of men over 40 over the period covered by this study. Female referrals remain constant for all age groups. This shift can pobably be attributed to general adolescent unrest characterized by drug abuse, passive-aggressive manifestations (dropouts), and aspects of psychosexual disturbance that constitute the substance of this study.

C. RESULTS

1. *Card III*

The various combinations of responses shown in Table 2 suggested that there might possibly be some relationship between a response on Card III and one on Card VII on the assumption that the paradigm "human" content on these cards should elicit indications of generalized attitudinal and affective sets toward interpersonal relationships. This expectation was not borne out. For Group I an r of .099 and for Group II an r of .037 was obtained between responses to Cards III and VII, warranting the conclusion that in both groups the tendency to give a particular response on Card III was not correlated with the tendency to give a similar response to Card VII. Consequently, hypothesis 7 was not confirmed.

Table 3 shows that younger patients in the early group (II) were very significantly differentiated from the later group (I) with regard to the percentage of male figures seen on Card III ($F = 31.32$, $p < .01$). The sexes of the respondents and interaction were not significant. Consequently hypothesis 3 was confirmed and it can be concluded that young people of the period 1954 and 1955 were more inclined to see male figures on Card III than were those, regardless of sex, in the years 1965, 1966, and 1967.

Table 4 shows there were no significant differences between the groups with regard to figures perceived on Card VII. Hypothesis 4 concerning postulated feelings and attitudes towards femininity was therefore not confirmed

TABLE 1

FREQUENCIES AND PERCENTAGES OF DIFFERENTIAL RESPONSES GIVEN TO CARDS III AND VII BY GROUP A. PRIVATE PATIENTS

Cards III	Cards VII	Later Females Group I	Later Males Group I	Total I	Earlier Females Group II	Earlier Males Group II	Total II	Total Males	Total Females
M	F	35(16.5)	19(7.0)	54(11.1)	22(11.0)	27(12.5)	49(12.2)	46(9.4)	57(14.3)
F	F	48(22.7)	69(25.4)	117(24.1)	6(3.2)	25(11.6)	31(7.7)	94(19.2)	54(13.6)
M	Ho	11(5.2)	14(5.1)	25(5.1)	41(22.1)	28(13.0)	69(17.2)	42(8.6)	52(13.1)
F	Ho	17(8.0)	40(17.2)	57(11.1)	13(12.4)	3	16(4.0)	43(8.8)	30(7.5)
Ho	Ho	18(8.5)	27(9.9)	45(9.2)	26(14.0)	18(8.3)	44(11.0)	45(9.2)	44(11.1)
M	(H)	13(6.1)	5(1.8)	18(3.7)	19(10.3)	12(5.5)	31(7.7)	17(3.4)	32(8.0)
F	(H)	14(6.6)	19(7.0)	33(6.8)	6(3.2)	7(3.2)	12(3.2)	26(5.3)	20(5.0)
Ho	F	8(3.8)	16(5.8)	24(4.9)	7(3.7)	10(4.6)	17(4.2)	26(5.3)	15(3.7)
F	M	5(2.3)	14(5.1)	19(3.9)	2	2	4	16(3.0)	7(1.7)
M	M	3	4	7(1.4)	5(2.7)	7(3.2)	12(3.0)	11(2.2)	8(2.0)
Ho	M	0	2	2	3	1	4	3	3
(H)	F	1	5	6(1.2)	3	1	4	6(1.2)	4
(H)	M	0	2	2	0	0	0	2	0
(H)	Ho	4	4	8(1.6)	3	3	6(1.5)	7(1.4)	7(1.7)
(H)	(H)	4	3	7(1.4)	4	3	7(1.7)	6(1.2)	8(2.0)
M	M&F	1	2	3	2	2	4	4	3
F	M&F	3	6(2.1)	9(1.8)	0	0	0	6(1.2)	3
Ho	M&F	0	2	2	0	1	1	3	0
M&F	F	4	2	6(1.2)	1	1	2	3	5(1.2)
M&F	Ho	2	2	4	2	1	3	3	4
M&F	(H)	1	1	2	1	1	2	2	2
M&F	Neutr.	1	1	2	0	1	1	2	1
MF	Ho	1	2	3	2	5(2.3)	7(1.7)	7(1.4)	3
MF	F	4	1	5(1.0)	3	5(2.3)	8(2.0)	6(1.2)	7(1.7)
MF	M	0	1	1	0	0	0	1	0
Ho	(H)	3	3	6(1.2)	7(3.7)	10(4.6)	17(4.2)	13(2.6)	10(2.5)
M	Neutr.	0	0	0	3	2	5(1.2)	2	3
Neutr.	F	3	0	3	2	5(2.3)	7(1.7)	5(1.0)	5(1.2)
Neutr.	Ho	4	1	5(1.0)	1	6(2.7)	7(1.7)	7(1.4)	5(1.2)
F	Neutr.	1	5(1.8)	6(1.2)	1	3	4	8(1.6)	2
MF	(H)	2	0	2	0	0	0	0	2
Neutr.	M	0	1	1	0	0	0	1	0
		$N=211$	$N=273$	$N=484$	$N=185$	$N=215$	$N=400$	$N=488$	$N=396$

TABLE 2
GROUP A: PRIVATE PATIENTS
Frequency and percentage distributions for age

Age	Later Group I			Earlier Group II		
	M %	F %	Total %	M %	F %	Total %
16-19	92(33.6)	41(14.6)	133(27.4)	33(15.3)	36(19.4)	69(17.2)
20-31	98(36.1)	92(43.6)	190(39.2)	87(40.4)	81(43.7)	168(42.2)
32-39	45(16.6)	37(17.5)	82(16.9)	37(17.2)	34(18.3)	71(17.7)
40+	38(14.1)	41(19.4)	79(16.3)	58(26.9)	34(18.3)	92(23.0)
	$N = 273$	$N = 211$	$N = 484$	$N = 215$	$N = 185$	$N = 400$

TABLE 3
ANALYSIS OF VARIANCE OF YOUNGER PRIVATE PATIENT GROUP'S RESPONSES TO CARD III

	SS	*df*	*MS*	*F*	*p*
Groups	4.29	1	4.29	31.32	<.01
Sex	.47	1	.47	3.34	ns
G × S	.21	1	.21		ns
Error$_w$	27.19	198	.137		
Total		201			

TABLE 4
ANALYSIS OF VARIANCE OF YOUNGER PRIVATE PATIENT GROUP'S RESPONSES TO CARD VII

	SS	*df*	*MS*	*F*	*p*
Groups	1.71	1	1.71	2.34	ns
Sex	.02	1	.02		ns
G × S	—	1	—		ns
Error$_w$	14.45	198	.073		
Total		201			

for the younger populations. It was also not confirmed for the total groups for prevalence of quasi-human and mythical figure (H) responses to this card.

Table 5 shows unambiguously that private patients in the early group (II) gave a significantly higher percentage of male responses to Card III than did those in the later group (I) ($F = 47.85$, $p < .01$). Group II females gave significantly more male responses than did Group II males ($F = 19.55$, $p < .01$). This suggests that female patients of that period were more stabilized in their sexual roles (or more submissive to its imperatives) than are the present "generation" of female patients. Hypotheses 1 and 2 with regard to a predicted shift in sexual identification and role concepts over the past decade are confirmed.

TABLE 5
ANALYSIS OF VARIANCE OF LATER GROUP I AND EARLIER GROUP II RESPONSES TO CARD III

	SS	*df*	*MS*	*F*	*p*
Groups	9.57	1	9.57	47.85	<.01
Sex	3.91	1	3.91	19.55	<.01
G × S	.63	1	.63	3.15	ns
Error$_w$	175.27	880	.20		
Total		883			

Table 6 shows that private patients in the early group (II) are significantly more likely to see male figures on Card III than are later group (I) patients ($F = 9.98$, $p < .01$). Older patients are significantly more likely to see male figures on this card than are younger patients ($F = 14.71$, $p < .01$). Finally, the difference between older and younger patients with regard to this factor is greater in the later group (I) than in the earlier group (II) (Group I, Older-younger, $r = -.035$; Group II, Older-younger, $+.46$). The difference between younger and older patients is greatest for males in the later group (I), as the younger females of the earlier group (II) actually see more male figures than do older females of Group II ($F = 114.95$, $p < .01$).

2. *Ho Responses (No Humans)*

Table 7 shows that the private groups do not differ with respect to failure to see human figures on Card III. However, there is a significant sex interaction ($F = 4.44$, $p < .05$) which shows that the difference between the sexes of Group II (F < M) differs significantly from Group I (F > M). Hypothesis 5 is only partly confirmed. Since failure to perceive human figures on Card III is regarded as an indication of empathic inadequacy, it is interesting to note the percentage of patients in both groups who fail to see human beings

TABLE 6
ANALYSIS OF VARIANCE OF GROUP, AGE, AND SEX FACTORS ASSOCIATED WITH SEX OF FIGURE SEEN ON CARD III

	SS	*df*	*MS*	*F*	*p*
Groups	1.87	1	1.87	9.98	.01
Sex	.62	1	.62	3.26	ns
Age	2.81	1	2.81	14.71	.01
G × S	—	1	—	—	ns
G × A	5.30	1	5.30	27.89	.01
G × S × A	21.84	1	21.84	114.95	.01
Error$_w$	62.59	335	.19		
Total		342			

TABLE 7
ANALYSIS OF VARIANCE OF NO HUMAN PERCEPTS (Ho) SEEN ON CARD III

	SS	*df*	*MS*	*F*	*p*
Groups	0	1	—	—	
Sex	0	1	—	—	
G × S	.652	1	.652	4.44	<.05
Error_w	128.87	880			
Total		883			

on this card (Group I males, 18.3 percent, females 14.2 percent, total 16.5 percent; Group II males 16.2 percent, females 23.7 percent, total 19.5 percent).

3. *M&F (symmetrical or identical figures on one card seen as a male and a female), MF (bisexual or hermaphroditic figures) and* NEUTER RESPONSES

Since a survey of the literature shows that responses of these types have the same general interpretative significance, it was decided to combine them for statistical purposes. Although hypothesis 4 focused upon Card VII, a subsidiary hypothesis would suggest that gender blurring, devaluative attitudes, and evasiveness would be more conspicuous in the later group (I) than in the earlier group (II) patients. The results show a significant difference between Group II and Group I men ($\chi^2 = 11.529$, $p < .001$) but in a different direction from what was predicted; i.e., the earlier group (II) males gave more responses of this type. It might be conjectured that since the later group (I) males see so many more females on Card III than do their earlier group (II) counterparts, there is probably a greater shift toward femininity and consequently less ambiguousness over role. Females of the earlier group (II) differ significantly from those of the later group (I) in the predicted direction ($F = 9.133$, $p < .01$), showing less gender ambiguity and its correlates than do the current female private patients.

The difference between the later group (I) men and women is highly significant ($\chi^2 = 16.221$, $p < .001$) and shows more diffuseness of identification for women in this group. This is just the reverse for the earlier group (II) men and women where the difference ($\chi^2 = 6.088$, $p < .05$) shows the males to be more vulnerable to ambiguous gender responses. The percentages are relatively low for these responses (Group II men 13.9 percent, women 5.9 percent: Group I men, 4.7 percent, women 16.1 percent). The percentages are low for similar responses to Card VII, ranging from 4.7 to 8.7 percent and nondifferentiating.

4. *Card VII*

Table 8 shows that the earlier group (II) gave significantly more Ho (no human) responses to VII ($F = 21.46$, $p < .01$) which is the reverse of what was anticipated. The percentages of patients who gave no human responses on Card VII are as follows: Group I males, 32.9 percent, females, 26.5 percent, total 30.1 percent; for Group II, males 42.6 percent, females 47.0, total 44.7 percent. There were no differences between the groups for M&F, MF, and Neuter responses combined to Card VII (7.0 percent for each group and almost identical percentages for each sex.)

TABLE 8

ANALYSIS OF VARIANCE OF NO HUMAN PERCEPTS (HO) SEEN ON CARD VII

	SS	*df*	*MS*	*F*	*p*
Groups	5.00	1	5.00	21.46	<.01
Sex	—	1	—	—	
G × S	.65	1	.652	2.58	ns
Error$_w$	204.82	880	.233		
Total		883			

5. *Responses to Cards III and VII Within the Same Test Protocol*

It has already been shown that a patient's response to Card III will not enable the examiner to predict what his response will be to Card VII and vice-versa even though both cards purport to elicit a "popular" human figure. Reference to Table 1 reveals a surprising finding concerning the incidence of a presumably "normal" response pattern: i.e., M on III and F on VII. It might have been expected that from 40 to 50 percent of patients would offer this combination, but only 9.4 percent of males and 14.3 percent of females, mean 11.8 percent, do so. Consequently, the conventionality of this pattern is dubious.

Table 1 provides other information of major significance as shown in Table 9. When females of the earlier group are compared with those of the later group and males of the earlier group with their later group counterparts it is found that both sexes of the later group show a highly significant preference for the F-F combination ($\chi^2 = 30.211$, $p < .001$ and 13.539, $p < .001$ respectively). The M-Ho pattern which gives preference to male figures on Card III is unambiguously an earlier group characteristic ($p < .001$ and $< .01$), but no significant differences emerge for the F-Ho, F-(H), and F-M combinations. This does not hold for the males in both groups in all respects. While there is no significant difference for the F-Ho and F-M combinations,

TABLE 9

SIGNIFICANCE OF DIFFERENCES BETWEEN LATER GROUP I AND EARLIER GROUP II WITH REGARD TO CARD III AND VII RESPONSES GIVEN IN THE SAME TEST PROTOCOL

(By sexes)

Card III	VII	Earlier Females Group II $N = 185$	Later Females Group I $N = 211$	X^2	p	Earlier Males Group II $N = 215$	Later Males Group I $N = 273$	X^2	p
M	F	22	35	1.450	ns	27	19	3.784	ns
F	F	6	48	30.211	.001	25	69	13.539	.001
M	Ho	41	11	23.360	.001	28	14	8.554	.01
F	Ho	13	17	.038	ns	3	40	24.682	.001
F	(H)	6	14	1.710	ns	7	19	2.578	ns
F	M	2	5	.347	ns	2	14	5.426	.05

earlier group (II) males show a distinct avoidance of this pattern ($p < .001$ and .05 respectively).

Table 10 discloses an even stronger confirmation of the basic hypotheses of this study when the total later group (I) is compared with the total earlier group (II). Group II is significantly more inclined to give M-Ho responses ($\chi^2 = 32.397$, $p < .001$), whereas Group I focuses upon F-(H), F-M, F-F, and F-Ho responses (.01, .05, .001, and .001 respectively). The differences are impressively significant and indicate that atypical combinations characterize the current private patient population's responses, especially with reference to the sex of figures on Card III. This confirms hypothesis 8 for Card III but negates hypothesis 4 for Card VII.

TABLE 10

GROUP A: PRIVATE PATIENTS

Significance of differences between total Group I and II for responses to Card III and VII given in the same protocol

Card III	VII	Group II $N = 400$	Group I $N = 484$	X^2	p
F	(H)	12	33	4.952	.01
F	M	4	19	6.288	.05
F	F	31	117	41.209	.001
M	Ho	69	25	32.397	.001
F	Ho	16	57	16.472	.001

6. *Group B, Clinic Patients*

The data show a tendency for the 1949-1951 males (Group III) to see more male figures on Card III than do the 1960-1963 (Group IV) males ($\chi^2 = 2.17$, $p < .10$) and a significant inclination for Group IV males to see females ($\chi^2 = 7.84$, $p < .01$). No significant differences were found for female patients. On Card VII, Group IV males see more females ($\chi^2 = 7.14$, $p < .01$ and 6.33, $p < .05$ respectively) than do Group III patients. Hence the Card III pattern agrees with findings for private patient Group A and confirms the response shift. There is no statistically significant difference between later and earlier private patient males for perception of females on VII ($F = 1.885$, ns.) but a marked readiness for females of the later private group to see females ($\chi^2 = 24.6000$, $p < .001$). It was noted previously that both A groups, regardless of sex, were almost identical in the incidence of M&F, MF, and Neuter responses to Card VII on which the female figure is almost as paradigmatic as the animals on Card VIII, and it might be suspected that after experiencing conflictual reactions to Card III the less ambiguous figures on VII were welcomed with a sense of relief. It should also be noted that the literature does not emphasize an interpretative specificity for Card VII as it does for Card III.

7. *Group C: V.A. Patients*

These data were analyzed specifically for response to Card III and the findings show that prior to 1960, 50.8 percent of patients saw males and 39.3 saw females ($N = 61$). Subsequent to 1960, 55.1 percent saw females and 33.3 percent saw males ($N = 78$). The difference is significant ($t = 1.92$, $p < .05$) and agrees with results obtained in the other groups. Consequently, it can be concluded that the difference between the socioeconomic status of this V.A. hospital population and the private population is not a relevant factor in the parameters studied in this investigation and that in all probability postulated sociocultural influences cut across socioeconomic levels in these Eastern Seaboard urban and metropolitan populations. It is also apparent that what was found for a contemporary psychiatric population also proved true for a nonpsychiatric control.

8. *Card VI: Group A (private patients)*

The data confirm hypothesis 6 with regard to the perception of an animal pelt on this card. In Group I, 49.5 percent of the men and 49.7 percent of the females saw this percept, and in Group II the figures were 49.7 percent for men and 45.9 percent for women. These figures are remarkably close and attest to the stability of the percept. The question might have arisen, and is still valid, whether changes in Rorschach percepts co-vary with a time factor. The present finding provides something in the nature of a reference point that would warrant the assumption that time alone is not a determining variable for change in this population of patients.

9. *Group B: Clinic*

The steadfastness of the animal pelt response holds up for the females of this group (Group III, earlier, 18.4 percent; Group IV, later, 21.3 percent), but the males of this group who are now seeing a significantly larger percentage of females on Card III (.01) are also seeing fewer animal pelts on VI. The earlier group—III—saw 40.2 percent as compared with 12.2 percent in the later group—IV—($\chi^2 = 12.3$, $p < .001$). The purported diminution in contactual motivation and drive, with subsidiary implications for psychosexual sensitivity suggests that the males of the inpatient and outpatient psychiatric service may be more disturbed in this respect than are the ambulatory private patients. Hypothesis 6 is not confirmed for male clinic patients.

D. Discussion

Hammer (7) suggests that his data make suspect the assumption that Card III is an index of sexual identification for males "unless the reader is prepared to say that most males, especially college students ($N = 95$), tend to be femininely identified." He based his statement upon conventional interpretations of Card III figures but did not raise the question of possible cultural change nor were retrospective data presented. Our more or less contemporaneous psychiatric and medical populations show a remarkable similarity for the perception of females on Card III when compared with Hammer's normals (Group I males 56 percent, later V.A. patients 55 percent, Hammer's normal males 52 percent, normal females 47 percent). His patients were drawn from a Guidance Clinic and were "exclusively non-Psychotic," and the number of cases is quite small (Clinic cases, 36 males, 55 females). In the light of our data it is very probable that his normal population is reflecting the same shift as ours and that a comprehensive study of *psychiatric* and "normal" subjects would show a significant similarity in the direction of change found in the present study. Hence, his conclusion seems to be invalid and it is unlikely that our patients are normal and more likely that his normals are not, within the framework of our hypotheses and results.

If, as postulated, the Rorschach is capable of reflecting cultural changes with special reference to sexual identification and role, then these results raise crucial questions concerning what is occurring in Western society at the present time in relation to adolescent unrest, manifestations of violence, the virtually intentional blurring of sex differences and the attendant emphasis upon being "people" rather than males and females, the drive on the part of some women for "liberation" from the stereotypes imposed upon them by males, such phenomena as high school and college dropouts associated with hostility toward the "establishment," the impressive prevalence of marijuana use by all segments of society, the shift on the part of younger people (only?) toward esoteric notions such as astrology and other types of divinatory systems, and the appearance of homophilic societies that promulgate their views and which seem to elicit some partisan support from the middle and upper middle segments of the population in the name of liberalism.

Upon the basis of our findings at least two divergent conclusions are possible; we can either conclude that clinically derived interpretations of responses to Card III specifically are erroneous, in which case the strikingly significant changes reported herein are mystifying, or we can conclude that such interpretations are valid and indicate that the current patient population, comprising in this case 1393 individuals, is characterized by gender blurring and homosexual inclinations, alienation from people, gross dissatisfaction with their sexual roles, feminized passivity on the part of males and masculinized aggressivity on the part of females, and other concomitant symptoms of sexual identification and role disturbances.

If we accept the assumption that interpretations are erroneous we can conclude further that perception of a female figure on Card III is normal and that the perception of a male figure on this card is deviant, as Hammer implies in his query. The implications of such a view are far-reaching with special reference to what the psychodiagnostician is reporting about the patient referred to him for a comprehensive assessment. If the therapist is informed that his patient has psychosexual conflicts, or if the Guidance Counselor who is working with adolescents comes to this conclusion upon the basis of Rorschach responses, the therapeutic approach and the quality of the relationship with the therapist or counselor will most surely be affected, as will be the aims of treatment. Viewed retrospectively, the clinical psychologist as psychodiagnostician has either misled a generation of psychiatrists and psychoanalysts or interpretations valid over a decade ago are valid today. The incidence of a phenomenon is no criterion of its normality (Kinsey *et al.* to the contrary), and if the Rorschach is reflecting increased feminization of the male and masculinization of the female we can either deny the truth value of what is being observed or conclude that we are witnessing a disturbing phenomenon. My own position is to take the findings at face value.

Certain questions of theoretical importance are generated by these findings with regard to the relative roles played by biological and social factors in the process of sex typing. If biological factors fix the psychosexual destiny of the individual it would follow that deviations from this canon would represent a disruption of normal biological development. If sociocultural factors predominate, it would follow that apart from woman's reproductive role (and test tube babies are more than a science fiction probability) and man's part in it the road to social-sexual reversals and variations is wide open and only limited by restrictions that might be imposed upon it by society.

The ethologists, among them Tinbergen and Lorenz, have made a strong case for the biological foundations of behavior patterns among animals and have tended to extrapolate this to human beings. Freud's conception of instinctual drives has a biological flavor, and even though Kaufman (9) has pointed out that "culture channels instinct," Freud's basic pessimism concerning the future of civilization suggests that he regarded the instincts as perhaps more potent and enduring than the less stable external modelling forces. If these assumptions represent a basic truth, social forces that divert biologically rooted instincts from their natural channels must be regarded as destructive and harmful to social organization in the long run.

However, a cursory scanning of world cultures will reveal the diversity of sexual roles as these are influenced by kinship patterns, economic factors, child-rearing practices, religious systems, and other forces. From a historical standpoint woman's role has shifted from chattel in medieval times to the much-courted consumer of our own times. If our findings showed nothing else, they would suggest that sex roles and identification are neither immutable nor inherently "right," that they are not necessarily welded to behavior-related and unchangeable endocrine or instinctual systems, and that for better or worse women can chafe at their traditional man-imposed roles and assume behavioral characteristics that offer some measure of gratification of their postulated penis envy and the prerogatives of a phantasied phallus. Males, on the other hand, may have grown weary of an aimless competitiveness in a depersonalized society that has robbed them of male-role attributes formerly clearly defined in nonmechanized primitive and agricultural societies and may be drifting toward the more passive-feminine components of their personalities that social forces formerly condemned. The confluence of factors responsible for these hypothesized changes may reflect a "sick" society, but patients do recover and another study 10 years from now may show a different picture. Of course, patients and societies also die. In essence, the problem boils down to an understanding of the nature of roles, their degree of plasticity, the underlying needs they serve, and whether they reinforce or undermine the social structure.

Other questions can be raised with regard to what these findings might be telling us about psychosexual development and the current state of Western society. If sexual identification and role concepts in the individual are fairly well-established by four or five years of age, and if these are deeply embedded in the characterological matrix and are capable of being uprooted and distorted only by severe traumas, then it is surprising that such a basic pattern can be reversed in the very short span of 10 years. If it is argued that all the subjects were "patients" of one kind or another and must have experienced such trauma, then note must be taken of the fact that the earlier groups were also patients who suffered from the same disabilities as the later groups. I have learned from many serial Rorschachs of patients in long term analysis that the figures seen on Card III on the first examination are stubbornly resistive to change over subsequent examinations. The question posed by these findings is whether sociocultural factors have produced a basic characterological alteration in the current populations studied rather than a temporary alteration in role-playing. The cultural factors I have in mind comprise blurring of role distinctions in the home, covert and overt denigration of the father and husband in entertainment media, erosion (with some exceptions) of public esteem for "heroes," the decay of paternal authority, and relinquishment of disciplinary responsibilities to mother, and perhaps a widespread cynicism about romantic love and the substitution of a mutually exploitative egalitarianism. If these factors are interacting with profound and destructive characterological changes in individuals, then one might well consider the deeper implications for the stability of affective bonds and their relevance to the cohesiveness of the family unit as the primary and indispensable area for the development of humanness.

The unanimity of findings between Group A and Groups B and C contributed and processed statistically by other psychologists does not dispose of the need to replicate this study in order to learn if there are regional characteristics similar to those found for older and younger patients. Is the "generation gap" so strikingly demonstrated in this study generalized throughout the country and particularly in its more conservative areas? Are these rural-urban differences? Would cross-cultural studies show the same results? Might the responses to Card III of black males 10 years ago show a shift opposite to that found for the white research population if Rorschach data were available? Are there measurable ebbs and flows of masculinity and femininity over periods of time, as a perspective on history would lead one to believe, and if so, what are their concomitants? These and other questions can only be answered by further research. Cognizance should also be taken of other Rorschach determinants, such as color, human movement, shading responses, and content, as these bear upon the quality of interpersonal relationships, with regard to affectivity, empathy, and sensitivity.

E. SUMMARY AND CONCLUSIONS

The Rorschach records of 1393 psychiatric and medical patients of both sexes and ranging in age from 16 to 40+ were evaluated for response to Card VI and the types of figures seen on Cards III and VII. Two populations consisting of private patients (884) and clinic inpatients and outpatients (370) for a total of 1254 were divided into subgroups separated by a period of 10 years. The third group consisted of 61 Veterans Administration Hospi-

tal medical patients seen from 1956 to 1959 and 78 from 1960 to 1967. A total of 747 patients from an earlier period and 646 from a later period was evaluated. Eight hypotheses were formulated upon the basis of clinical observations that suggested a change in the sex of the figures seen on Cards III and VII and contrary to expectations based upon consensually accepted modal and deviant responses to these cards. Responses of the type relevant to the study were categorized. The major hypothesis stated that the earlier patients would exceed the later ones in the frequency with which male figures would be perceived on Card III, and subsequent hypotheses were derived from this central one. The following results were obtained:

1. There has been a significant increase in the number of young males referred for psychological assessment and a concomitant decrease in the number of males over 40 referred for this purpose. Female referrals remain constant.
2. No relationship was found between the type of figure seen on Card III and that seen on Card VII.
3. Younger early patients regardless of sex were signfiicantly differentiated from younger patients in the later group with regard to the incidence of male figures seen on Card III, the earlier patients seeing more males.
4. There were no significant differences between the groups for figures perceived on Card VII.
5. Private patients of the earlier period gave a significantly higher percentage of male-figure responses than did members of the later group. This also held true for female patients.
6. The difference between youngr and older patients with regard to the incidence of male figures on Card III is significantly greater for the later than for the earlier groups. Distinct evidence for a postulated "generation gap" is suggested.
7. A larger number of patients of both groups failed to see human on Card III than would have been estimated from clinical impressions.
8. Male and female patients of the later group differ significantly from each other with regard to gender blurring, devaluative attitudes, and evasiveness, the women exceeding the men in this respect. In the early group males are more vulnerable to ambiguous gender responses.
9. A relatively small percentage of all patients see a male figure on Card III and a female figure on Card VII.
10. Both sexes of the later group show a significant preponderance of females on III and on VII within the same protocol when compared with the early group. Perception of a male on III and no human on VII is definitely

an early group characteristic. Males in the early group show a distinct avoidance of the female on III and no humans on VII and the female on III male on VII combinations.

11. The differences between the groups are impressively significant with regard to the prevalence of atypical combinations, the later group outstripping the earlier one in this regard.

12. There has been no change in the incidence of animal skins seen on Card VI for Group A members. In the clinic group a significant percentage of later males who are now seeing more female figures on Card III are seeing fewer animals skins on Card VI.

The general and specific assumptions of the study were largely confirmed and their theoretical and practical implications were discussed.

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COLLEGE STUDENTS' PERFORMANCE ON THE "FRUIT-TREE EXPERIMENT" UNDER VARIED CONDITIONS OF COLOR AVAILABILITY*

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A. INTRODUCTION

A number of "fruit-tree experiments" (1, 2, 3) have demonstrated that children prefer the apple tree when requested to draw a picture with a fruit tree in it. Children's responses in 28 countries have been examined, and even in those countries where apple trees do not grow, it has been the most frequently drawn fruit tree.

Adler (4), using children in this country, varied availability of colors for drawing and examined the frequency with which apple trees were chosen in each of four color-availability conditions. The apple tree was drawn more often if the color red was available. When orange, but no red color, was available, orange trees were drawn by a majority of the children. Adler (5) replicated this study with retarded children. Essentially the same trends were found in normal and retarded children.

No "fruit-tree experiments" with adults have appeared in the literature. The present study was designed to examine college students' preferences under differing conditions of color availability and to compare these findings with those reported by Adler (4) for 6- to 12-year-olds.

It was hypothesized in the present study that college students, under various conditions of color availability, do not differ significantly from children in types of fruit trees drawn. It was further hypothesized that there is no significant difference in proportion of persons drawing an apple tree as part of a scene, all colors available, and naming an apple tree as a word association response to the stimulus words, "fruit tree."

B. METHOD

1. *Subjects*

The *S*s were 178 male and female students, ages 18 to 22, enrolled in five introductory psychology classes at Georgia Southern College.

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2. *Procedure*

The five classes were designated Groups I-V, as follows: Group I: All colors available; Group II: Red, blue, yellow available; Group III: Green, orange, brown available; Group IV: Pencil available; Group V: Word Association test.

In Groups I-IV the "fruit-tree experiment" procedure was followed. *S*s in Groups I-III were given crayons and a sheet of paper and instructed, "Draw a picture—any scene in color—with a fruit tree in it." Group IV, given pencils, was instructed: "Draw a picture—any scene—with a fruit tree in it." At the end of five minutes, *S*s wrote on the back of the drawing the type of fruit tree depicted.

*S*s in Group V participated in a word association test, in which they wrote the first example that came to mind in response to three orally presented categories. The categories were outdoor game, wearing apparel, and fruit tree. The fruit tree category was the only one of interest in the present investigation.

C. RESULTS

There were 10 varieties of fruit trees chosen in all five groups; this compares to 18 varieties in Adler's (4) study of children, aged 6 to 12. The results for each group were as follows: Group I ($N = 36$), 4 varieties; Group II ($N = 30$), 4 varieties; Group III ($N = 34$), 7 varieties; Group IV ($N = 37$), 7 varieties; Group V ($N = 41$), 7 varieties. The apple tree was first choice in all groups, except Group III, where orange trees ranked first (73.73 ercent) and apple trees, second (20.59 percent).

A 2 × 5 chi-square test was used to examine the five groups' preference for apple trees and all other fruit trees. The obtained chi-square of 35.34 ($df = 4$, $p < .01$) indicated that the groups' responses were significantly different.

Table 1 presents a comparison of the results of the present study and the results obtained by Adler (4).

TABLE 1

PERCENTAGE OF COLLEGE STUDENTS AND CHILDREN SELECTING APPLE TREES

	College students %	Children (Adler) %	p
Group I	75.00	53.03	$<.05$
Group II	83.33	53.04	$<.01$
Group III	20.59	16.10	n.s.
Group IV	67.57	60.47	n.s.
Group V	70.73	—	—

Analyses to determine if the proportion of college students choosing apple trees differed significantly from the proportion of children choosing apple trees in each of four conditions of color availability revealed a significant difference in Groups I and II only. Comparing college students and children in Group I (all colors), $z = 2.47$ ($p < .05$). Similarly, in Group II (red, blue, yellow), $z = 3.19$ ($p < .01$). In both instances, college subjects drew apple trees significantly more often than did children.

Groups I and V of the college students were compared to see if there was a significant difference in the proportion of persons drawing an apple tree (all colors available) and naming an apple tree as the first response to the auditory stimulus, "fruit tree." No significant difference was found ($z = .642$).

D. Discussion

The hypothesis that college students, under various conditions of color availability, do not differ significantly from children in types of fruit trees drawn, was rejected. College students in Groups I (all colors available) and II (red, blue, and yellow available) drew apple trees significantly more often than did children in Adler's (4) study. No explanation for this result is offered at the present, although in view of the current collegiate emphasis on "doing your own thing," it was surprising to find their preferences so homogeneous and conforming. This conformity (or uniformity) was again reflected in the number of different fruit trees selected: 10 varieties for college students compared to 18 varieties for children.

The hypothesis that there is no significant difference in proportion of persons drawing an apple tree and naming an apple tree in response to the stimulus words, "fruit tree," was not rejected. Is the apple tree the most frequently selected fruit tree due to the ease with which it can be drawn or due to its being the first fruit tree to "come to mind?" The present results indicate that the latter possibility is more likely.

Of interest is the fact that *S*s in the current investigation were predominantly from Georgia, the Peach State, and yet not a single *S* drew or named a peach tree.

The drawings of the college students were surprisingly childish; it is doubtful if they are distinguishable from grammar school art. Possibly two factors contributed to the poor quality of drawing: a five-minute time limit was imposed, and crayons were used. It would be informative to vary time allowance and to substitute colored pencils for crayons. Crayons may be strongly associated with early childhood activities hence eliciting childish drawings.

E. SUMMARY

The performance of 178 college students on the "fruit-tree experiment" under varied conditions of color availability was examined. Apple trees outranked all other trees in each condition except where orange but no red was available. Orange trees were most frequently drawn under this condition. Performance of college students was compared to that of children in a previous study (4), and it was found that college students depict apple trees significantly more often than do children when all colors and when red, blue, and yellow only are available. When frequency of drawing an apple tree (all colors available) was compared to frequency of naming an apple tree in response to the word association stimulus, "fruit tree," no significant difference was found.

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THE USE OF COVERT REINFORCEMENT IN THE MODIFICATION OF ATTITUDES TOWARD THE MENTALLY RETARDED*

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A. INTRODUCTION

The recent paper by Cautela (1) introduces a procedure which he labels "covert reinforcement" (COR). Cautela labels this procedure "covert" because both the response to be increased and the reinforcing stimulus are presented in imagination by instructions. A crucial assumption of COR is that a reinforcing stimulus presented covertly has the same functional relationship to overt behavior as a stimulus presented externally.

In his article on COR, Cautela presents anecdotal evidence on how COR is effective in therapy. Cautela, Steffen, and Wish (4) attempted to provide experimental confirmation that a reinforcing stimulus presented in imagination can increase response probability. Their study showed that perceptual judgments (circle size estimation) can be manipulated by use of the COR procedure.

The present study was designed to determine if attitudes towards retardates (self-report) could be changed in a positive direction by employing the COR procedure.

B. METHOD

1. *Subjects*

Forty-two undergraduate students at Stonehill College, North Easton, Massachusetts were used as *S*s. The experimental (COR) group consisted of 21 *S*s enrolled in one section of an abnormal psychology course, while 21 treatment-control (non-COR) *S*s were enrolled in another section. Sex of *S*s was not recorded.

2. *Procedure*

A Likert-type questionnaire, The *Mental Retardation Opinionnaire,* was constructed by the authors. A pool of 65 items was collected by adapting and

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[1] Authorship is considered coequal.

rewording items found in the literature on attitudes toward the mentally retarded and other groups who have been the recipients of negative attitudes (3, 5, 6). Three specialists[2] in the area of mental retardation rated these items on the criteria of relevance to the attitude object (i.e., a mentally retarded person), clarity of wording, and positive or negative quality. The final questionnaire consisted of 30 items (15 negative and 15 positive) on which the judges showed unanimous agreement across all criteria. *S*s were asked to rate each item on a four-point scale ranging from "Disagree strongly" to "Agree strongly."

Both COR and non-COR groups were asked to fill out the questionnaire as part of a study. *S*s were not told the purpose of the investigation.

One week later the non-COR group received the following instructions:

> Please sit back in your chairs and relax as best you can, placing both feet on the floor and hands folded in front of you. Now, close your eyes and imagine a mentally retarded person as vividly as you can. By "vividly" we mean really try to imagine as many details as possible—i.e., the color of his eyes, the expression on his face, the way he walks, etc. When you can do this, please raise your hand.

The *E* then went over the scene once more and asked *S*s to practice it at home at least twice a day.

Also one week after the administration of the questionnaire, the COR group was given the same instructions except that in addition to the "mental retardate" scene, *S*s were asked to imagine an idiosyncratically pleasant scene. The additional instructions were as follows:

> O.K. Fine. Please put the picture of the mentally retarded person out of your imagination for a while. Now, still relaxed and with eyes closed, try to imagine yourself doing something you enjoy very much and which gives you a great deal of pleasure. For example, some people enjoy . . .

At this point *S*s were given examples of potentially pleasant scenes from the Reinforcement Survey Schedule (2). *S*s were given another trial with the pleasant scene alone. *S*s were then asked to pair the two scenes by first imagining the mental retardate and then shifting to the pleasant scene when *E* said, "Shift." In all, the COR group received two trials of the mental retardate scene alone, two trials of the idiosyncratically pleasant scene alone, and four trials of the paired scenes using the "Shift" technique. *S*s were asked to practice this paired sequence at home at least twice a day.

Three weeks after the scene presentation, the attitude questionnaire was re-administered to both groups. At the second administration, *S*s were also asked to indicate, (*a*) the number of times they practiced the imagination scene(s), and (*b*) whether they realized the purpose of the experiment.

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[2] The aid of Dr. Beatrice H. Barrett, Dr. John B. Junkala, and Mr. James McCormack is gratefully acknowledged.

Questionnaires were scored in the following manner: The 15 positive items were scored with the "Agree strongly" response given the maximum weight of 4. The 15 negative items were scored in the opposite direction with the "Disagree strongly" response given a weight of 4. Weights for each item were added, resulting in a single summation score for each *S*. The range of possible scores was 30 (negative) through 120 (positive).

C. RESULTS

Only two *S*s out of 42 reported correctly the purpose of the experiment.

A two-tailed *t* test between pretest means failed to show a difference between groups.

A *t* test of difference of differences showed a difference (positive direction) between increase in scores showed by the non-COR group and the increase in scores showed by the COR group. The COR group showed a significant increase in scores at the .01 level from pretest to posttest, while the non-COR group did not ($t = 3.33$, one-tailed test, $df = 40$).

The COR group reported practicing a total of 93 times and the non-COR group reported 91 times.

A 2 × 2 chi-square test of independence incorporating Yate's correction for continuity was performed for both groups. No significant association was found in either group between those *S*s who reported practicing the imagination scenes and either increase or decrease in score.

D. DISCUSSION

In view of the small number of reinforcing pairings presented by the *E* and the relatively small number of reported practice sessions (an average of four times per subject over three weeks), it is surprising that there was a significant increase only in the COR group. While the data indicate that response probability of positive attitude toward the retarded was increased, there are some problems in interpretation of the data.

On the basis of the reported numbers of practice sessions (they were essentially the same), it is difficult to attribute the difference between the two groups on the basis of exposure in imagery to a mentally retarded person. However, it is possible that the COR group actually did have a greater number of images of a mentally retarded person than did the non-COR group, since one would predict that COR would increase the number of images. Unfortunately, our procedure did not include gathering data on the number of times *S*s thought about (distinct from practicing) a mentally retarded person. Even if the COR group did have more images than the non-COR group, it appears unlikely that mere exposure in terms of images rather than interaction with a mentally retarded person could result in a more positive attitude.

Another possible interpretation of results is that when *S*s were asked to "shift" from a mentally retarded person to a pleasant scene, there was some overlap between the two scenes. Therefore, by contiguity, the mentally retarded person would "pick up" reinforcing properties. This would mean, of course, a greater preference for a mentally retarded person. This contiguity interpretation has some supportive evidence. In a study by Cautela and Wisocki (3) attitudes toward the elderly were increased in a positive direction by pairing an elderly person with a reinforcing scene.

The present study lends further evidence to the feasibility of manipulating attitudes through techniques of behavior modification.

E. SUMMARY

The purpose of the present study was to determine if the procedure "covert reinforcement" (1) could be effective in modifying attitudes.

Forty-two *S*s were divided into two treatment groups: a group receiving COR (21 *S*s) and a group receiving an imagination scene without COR (21 *S*s).

Posttest scores were obtained three weeks after the administration of the COR treatment. A *t* test showed that the COR increased significantly in a positive (positive attitude) over the non-COR treatment group.

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MEASUREMENTS OF ACCEPTANCE, ALLOWING SELF-DIRECTION, INVOLVEMENT AND EMPATHY IN ADULT-CHILD INTERACTION*[1]

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A. INTRODUCTION

The behavioral assessment of empathy has been of growing interest to researchers in psychotherapy (2, 3, 4, 14). Also, recent trends in the direct observation of families (5, 6, 7, 11, 12, 16) have spurred research on many facets of interpersonal behavior. A recent direct observational scale of empathy for adults in spontaneous play with a child was designed to assess the parent-behavior with her child as a part of a research, diagnostic, or therapeutic situation (10). The seven-point bipolar scale ranged from measuring the highest level of responsive and empathic behavior at one extreme to the least empathic, highest self-involvement evidenced at the other extreme.

However, on consideration, after applying the measure in more situations, it seemed to the writers that there are distinct variables which make up the total of empathic behavior which, if isolated, would serve a wider range of research purposes in developmental psychology, personality formation, child psychotherapy, and family dynamics.

The earlier scale, therefore, has now been elaborated to allow for separate coding on five-point scales of three major aspects of empathy which seemed to be incorporated in the earlier measure.

B. THE SCALES

1. *Communication of Acceptance*

The first dimension, the verbal expression of acceptance-rejection of the child by the adult, is the major element in the communication of empathic feeling. This dimension is one considered by Rogers (13) to be one of the necessary conditions for therapeutic personality change. It does not usually occur

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in a large degree in general, spontaneous interaction between parent and child, but has been regarded as a measure of success in learning a therapeutic role (14, 15). Also, verbal acceptance of a child's feeling may be an important variable in explaining exceptionally positive or healthy adult-child relationships.

The scale ranges, as does each measure, from a high rating of one to a low rating of five. Each point on the scale is followed by typical responses obtained from codings of the direct observations of parent and child.

1. *Verbal Recognition and Acceptance of Feelings:* Examples: You're proud of how you fixed that; That makes you feel good; That made you angry; You feel better already; You're enjoying that; You really like smashing that.

2. *Verbal Recognition and Acceptance of Behavior Only:* Examples: You got it that time; You really stabbed him; You're getting a workout; Bam, Bop, etc.; You're hitting the mother doll.

3. *Social Conversation or No Conversation:* Examples: I'm not so good at building toys; Mary's been away most of the summer; Mothers aren't very good at that; These are nice toys.

4. *Slight or Moderate Verbal Criticism Stated or Strongly Implied:* Examples: That's cheating; The head you made is too big; You'll ruin the floor; That's not fair; You'll have to be more careful; Watch what you're doing; No, not that way.

5. *Verbal Criticism: Argumentative, "Preaching," Openly Rejecting Feelings or Behavior, Abusive Language:* Examples: It's not nice to feel that way; You're nasty; I'm talking to a dope; You're not so hot yourself; You're a fresh kid; You see, I told you to do it the other way.

2. *Allowing the Child Self-Direction*

Paralleling the specific verbal expression of acceptance is the behavioral willingness on the part of the adult to follow the child's lead—to allow the child self-direction in behavior rather than attempt to control his behavior. This subscale ranges very widely in the spontaneous interaction between parent and child (14) and thus would seem to have greater utility as a separate scale for developmental studies and for more commonly observed natural adult-child communication.

1. *Shows Willingness to Follow Child's Lead* (No indication to the contrary: i.e., there need be no verbal comment; *behavior* compliant with the child's directions or lead is sufficient.) Examples: You want me to do it for

you; I'm supposed to pick them up (or simply moving to do so); You'd like me to play catch with you (or simply doing so at the child's request).

2. *Child Has Option for Lead-Taking.* (Choice genuinely left to the child but mitigated by direct or indirect suggestions; gives unsolicited praise; volunteers information; asks for information.) Examples: What shall we do?; What would you like me to make?; You did that right; Shall we pretend it (the phone) rings?; It's under the table; You can shoot this if you want; Good ("Good" reinforces a certain type of activity and therefore represents a degree of parental control).

3. *Takes Lead Without Giving Child an Option.* Unsolicited instruction on how to do or accomplish something; "teaching," praise accompanying a suggestion; questions with intent to guide the child. Examples: Play with what you have; You have to keep practicing; Maybe the best way is to take the crayons out of the box; Take your time and aim it; See if you can do it again just like that; Are you sure that's the way it goes?

4. *Directs or Instructs Child to do Something.* Initiating new activity when there has been no previous sign of inertia and/or resistance shown by the child. Examples: put the tinker toy away first; Why don't you paint something; Let's play with clay; You'd better put him back together; Don't squeeze water in there.

5. *Persuades, Cajoles, Demands, Pushes, Interrupts, Interferes in Child's Activity, Insists on New Activity.* Resistance by the child is implicit, or there is other involvement, or inertia, on the part of the child which the parent is seeking to overcome. Examples: You've got to play with something else now; You'd better give me one; You can't do that anymore; I told you not to turn out the lights; That's enough of that; No, take this one.

3. *Involvement*

This dimension of parental behavior may or may not contribute in a positive way. That is, involvement may be sympathetic or nonsympathetic, highly directive or appropriately supportive. It is a measure of the adult's attention to and participation in the child's activities.

1. *Fully Observant of Child's Behavior, Adult gives no indication of being unaware of the child's behavior;* More attention is given to the child than to other stimuli, such as the objects the child is using. (Such attention is not necessarily sympathetic or constructive.) The parent may be involved in a joint activity: e.g., role playing, games. He participates in an active way physically as well as verbally where it is appropriate.

2. *High Level of Attention.* Although not involved in anything other than

that which also involves the child, the adult's concentration here is almost exclusively on activities *per se* rather than child's behavior. Joint activities, such as card playing and dart shooting, lend themselves to "2" scores when the parent is keenly interested in the game itself (e.g., the cards that turn up), without paying attention to the child's reactions and behaviors.

3. *Marginal Attention: The adult is involved in his own independent activity to a degree that interferes somewhat with attention to child.* No joint activity. Adult is preoccupied with own activities to the extent that he is not always providing company: e.g., briefly primping in a mirror, briefly attending to own attire, inspecting nails. The adult may occasionally remark spontaneously on the child's activity.

4. *Partially Withdrawn, or Preoccupied.* Adult may infrequently observe child's activity, but doesn't comment spontaneously. Adult may be so involved in his own role (e.g., in independent play) that he fails to attend to the child's apparent needs. He responds promptly, however, when alerted by the child.

5. *Completely Preoccupied, or Self-Involved, or Shut-Off.* Here the child is ignored and must repeat or prompt to get a response from the adult. The adult is completely absorbed with an independent activity or with his own thoughts for prolonged periods, or engaged in prolonged self-grooming; seemingly unaware and uninterested in child's behavior.

C. Scoring

When all scales are considered together as components of empathic behavior, the highest level of empathy is evident when the adult (*a*) attends fully to the child's behavior, (*b*) comments frequently on the child's expression of feeling or behavior in a genuinely accepting manner, and (*c*) shows clearly that the child is fully permitted to engage in his present activity. The lowest level of empathic communication would be one where the adult is either (*a*) shutting himself off from the child who must repeat or prompt to get a response from him, or (*b*) verbally rejecting the feelings or behavior of the child, and (*c*) cajoling, demanding, and redirecting the child's activity.

A rating is made for every three-minute interval on a score sheet as illustrated in Figure 1.

Scoring is retrospective for each three-minute interval for all categories. Thus, in each case the coder enters a score which he thinks may qualify as the highest or lowest for the three-minute interval as it occurs, and changes it if necessary during the remainder of the three-minute interval. To obtain a subtotal score for *Communication of Acceptance,* highest and lowest scores are averaged. The lowest score only is entered for the subscales *Allowing Child*

					Score
COMMUNICATION OF ACCEPTANCE	Score Highest Level Score Lowest Level	1/2	1/3	2/2	4/7 = 11 ÷ 2 = 5.5
ALLOWING SELF-DIRECTION	Score Lowest Level only	3	2	5	10
INVOLVEMENT	Score Lowest Level only	5	3	5	13
					28.5

FIGURE 1
SAMPLE OF SCORING SHEET FOR NINE MINUTES OF CODING

Self-Direction and *Involvement*. As *Empathy* score may be obtained by totaling the three totals of the subscales. The lower the score, the more empathic the behavior.

D. RELIABILITY

The ease and accuracy of coding is attested to by the high reliabilities obtained by six pairs of coders. Reliability was established for each of the major variables of which the total empathy score is comprised. After four training sessions of collaborative rating on half hour play sessions, followed by discussion, six pairs of coders independently rated seven to ten mother-child play sessions of 20 minutes to one half hour each. Pearson product-moment correlations for the six coder pairs are found in Table 1.

E. RELATIONSHIPS AMONG SUBSCALES

In order to determine whether the three subscales are in fact largely independent of one another, as was our assumption in breaking down the original

TABLE 1
RELIABILITY CORRELATIONS FOR CODING EMPATHY

	Coder Pair					
Variables	1	2	3	4	5	6
Communication of Acceptance						
Highest Expression	.92	.98	.89	.97	.48	.78
Lowest Expression	.99	.97	.94	.91	.78	.89
Allowing Self-Direction	.84	.96	.93	.78	.75	.52
Parental Involvement	.86	.86	.95	.96	.92	.73

Note: A correlation of .58 is significant at the .05 level; .75 at the .01 level for an *N* of 7.

empathy scale into these three parts, correlations were obtained among the subscales. Data were obtained from observations of 51 mother-child play session interactions of 20 minutes duration. (These sessions were part of a diagnostic battery for parents applying for help with their emotionally disturbed young children.) These intercorrelations are presented in Table 2. Communication of acceptance is significantly correlated with both Allowing Self-Direction and Involvement, but the correlations are only moderate in degree indicating that it is not inappropriate to use the scales separately.

TABLE 2
INTERCORRELATION OF EMPATHY SUBSCALES

Variables	Allowing Self-Direction	Involvement
Average Communication of Acceptance	.33*	.48**
Allowing Self-Direction		.09

* $p < .02$.
** $p < .001$.

When the data as a whole are considered, perhaps the most advantageous way in which to analyze Empathy in adult-child interaction would be to use these scales independently and employ a multiple r or partial *r* paradigm to study their relationships to other variables.

F. CONCURRENT VALIDITY

In order to determine concurrent validity, the relationship of the present measure to the former empathy measure for adult-child interaction (10) was tested as follows. Two coders each having had experience with the two respective coding systems observed and independently coded seven mother-child pairs in 20 minutes of free play interaction, one using the old and one using the new scale. The children ranged in age from 4 to 10 years. The mothers observed were naive with regard to any expectation for their behavior; they were observed as part of the diagnostic intake procedure prior to the formation of filial therapy groups. These observations were conducted through a one-way vision mirror in a playroom. An overall empathy score was obtained from the present scale according to the instructions cited previously. The Pearson product-moment correlation with total score on the original empathy measure was .85 which is significant at less than the .005 level for a two tail test. Thus, it seems one would not sacrifice much in the way of an overall assessment of empathy via the previously reported measure by breaking it into separate components.

G. Construct Validity

Filial Therapy is a method of helping emotionally disturbed children by utilizing their parents as psychotherapeutic agents (1, 8, 9, 14). The method involves training parents in such empathic skills—modeled after Rogerian play therapy techniques—as the present scales are intended to measure. If these scales reflect the changes which the training is designed to produce, it would provide evidence suggesting the validity of the scales.

A study was therefore conducted utilizing 51 mothers and their children who were participants in a larger research project on the efficacy of filial therapy. The scales were first utilized to code a pretraining free-play session of each mother and child pair during the intake process. The mothers were then organized into groups of six to eight to receive their training in weekly sessions lasting two hours. The principles and rationale of the Rogerian approach were explained to the mothers, and they observed two or three demonstration play sessions conducted by the therapist. In the course of the next several months each parent then conducted three more play sessions with her child.

Mean comparison between the pretraining play session and the first and third posttraining sessions are shown in Table 3.

TABLE 3
Means and Mean Changes on Empathy Variables Diagnostic, First, and Third Training Sessions

	MEANS			*t*-Tests	
Variables	Pretaining	1st	3rd	P.T.-1	1-3
Reflection Feeling High	15.90	10.33	9.20	10.43***	2.22*
Reflection Feeling Low	20.90	16.78	15.67	6.25***	2.75**
Reflection Feeling Average	18.42	13.36	12.42	8.45***	2.20*
Allowing Self-Direction	19.35	11.39	9.88	11.04***	2.50**
Involvement	14.33	9.33	7.94	8.83***	3.67***
Average Empathy	2.57	1.62	1.44	14.23***	4.05***

* significant at $p < .025$.
** significant at $p < .01$.
*** significant at $p < .0005$.

Highly significant changes were shown on each scale and for the Average Empathy score. The fact that these highly significant differences were found not only between the pretraining and the first posttraining session, but even between the first and third of the training sessions themselves demonstrates that the scales are extremely sensitive measures of the behaviors in question. (The latter difference also suggests, incidentally, that training and practice, and not just a different "set" or intention, were involved in producing the changes.)

H. SUMMARY

The measure of empathic interaction for parents in spontaneous play sessions with their children previously developed by the authors was refined and further delineated to comprise three separately scorable subscales. The new coding system demonstrates concurrent validity by correlating .85 with the previously developed measure of empathy, while at the same time offering measures of three other variables which are relatively independent of one another: Acceptance, Allowing Self-Direction, and Involvement. Construct validity for each subscale and the total empathy score was demonstrated with a group of 51 mothers who underwent training in conducting Rogerian play therapy sessions. It is suggested that the subscales would be useful for a wider range of problems in developmental psychology, personality formation, child psychotherapy, and family dynamics.

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THE EFFECTS OF T-GROUP TRAINING ON BUSINESS GAME RESULTS*[1]

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Deep, Bass, and Vaughan (2) tested the commonly held assumption that T-group training in intact work groups contributes more to organization effectiveness than does T-group training of individual organization members with members of other organizations. The *S*s were 93 graduate buiness students who participated as nine companies in the Carnegie Tech Management Game.

They found that, contrary to expectations, companies composed of intact T-groups performed less well on tangible measures of company effectiveness than did companies composed of individuals who had not been members of the same T-group. Measures of company effectiveness included company profit, gain in stock price, cost of poor planning, and forecasting error. As was expected, companies composed of intact T-groups were more cohesive than companies composed of subdivided T-groups.

Several weaknesses limited the study. There were no control groups or comparison groups that received no training. The effectiveness of the T-group design, split T-group sessions, is open to question. The laboratory covered a 15 week period, with T-groups meeting for two hours once each week. Reports of split T-groups have consistently shown them to be a relatively ineffective medium of change (1, 4). Finally, the companies which served as the setting for the research were not formed until 15 weeks after the completion of the T-group training. Thus at the time the T-group training was being conducted, the companies had no established norms of group functioning. The activities in the T-groups could not, therefore, center on the unfreezing of existing group norms and the development of new, more effective group process norms.

The present research tests the findings of the Deep, Bass, and Vaughan study. The hypotheses were tested in a laboratory study with a pretest, post-

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test with control group design. The *S*s were 75 seniors and graduate students enrolled in a business policy class. The *S*s were randomly divided into 15 groups of five who, as a normal part of their classwork, participated in the General Business Management Simulation (3).

After one year of simulation operations, four quarterly decisions, 50 of the Ss participated in a two-day, task-oriented T-group training session. Five of the companies participated in the training as intact work groups. Five of the companies were fragmented and their members participated in the training with members of other companies. The remaining five companies received no training and served as controls. After the T-group training, all *S*s rejoined their original companies and completed an additional two and one-half years of simulation operations.

The findings from the study confirm the Deep, Bass, and Vaughan results. Companies who were trained as intact groups performed significantly less well in terms of both accumulated profit and increase in stock price, measures similar to these used by Deep *et al.*, than did either fragmented trained companies or control companies. In addition, intact trained companies increased significantly more in cohesiveness following the training than did either the fragmented trained companies or control companies.

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GROUP RISK TAKING AND CONSTITUENCY POWER*[1]

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A. INTRODUCTION AND PROBLEM

Recently there has been a plethora of studies within social psychology dealing with the phenomenon of group risk taking. The general finding in these studies is that when a group is confronted with a decision that involves risk, the group decison is significantly more risky than the average decision of the individual member working alone. Since Stoner (7) first demonstrated that groups have a tendency to take greater risks than individuals, numerous studies have shown similar results over various conditions and tasks (1, 8, 9, 10). A thorough review of this literature can be found in Kogan and Wallach (4).

In many of these studies it has been mentioned that these findings (risky shift) have important implications in real life situations, such as committee decision making. Kogan and Wallach state "It would be most surprising if the shifts toward risk taking observed here and in our previous experiments did not have some counterpart in the actions of governmental decision-making bodies" (4 p. 460). Except for the use of the dilemma items where the consequences affect a hypothetical person, all consequences have affected only those in the group. Only in a very broad sense could these groups be construed to represent committees. Committees are usually a subsample of a larger organization and are called on to make decisions that have consequences for other people. Unfortunately the studies done in the area of risk taking have ignored many of the conditions under which committees operate. One factor that differentiates committees from the groups used in risk taking studies is who is affected by the group decision. The studies so far have been such that the consequences affect only the members in the group (decision makers) or some hypothetical person. Committees, on the other hand, are confronted with making decisions that may affect not only themselves but

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[1] This paper is a partial summary of a dissertation submitted to the Department of Psychology, Wayne State University, in partial fulfillment of the requirements for the Ph.D. degree. A paper reporting these data was read at the annual meeting of the Southeastern Psychological Association in New Orleans, March 1969.

others (constituents) as well. In addition, committees reach decisions that involve other people who have the power to dismiss the decision makers if they are in disagreement with the decisions being made. If a senator from an agricultural state votes or makes decisions that are not perceived by farmers to be in their best interest they will let him know about it in the next election. The effect of deciding for others has been discussed by Madaras and Bem who claim that "another force toward conservatism might be a decision-maker's feeling of responsibility for the possible failure of the chosen alternative if the consequences of such failure would impinge on others" (5, p. 363).

This study was then an attempt to shed some light on the area of risk taking by answering the following questions:

1. Do decision makers still show the risky shift after group discussions when their decision has consequences for other people (constituents)?
2. If constituents are given the power to replace the decision makers, does this affect the group decision?

B. METHOD

1. *Subjects*

Subjects were 180 male undergraduates in the introductory psychology courses for the winter and spring quarters at Wayne State University. Subjects were randomly assigned to three experimental conditions. Each condition consisted of 15 four-man groups.

2. *Procedure*

When each four-man group arrived they were seated around a table. On the table, in the middle, was a tape recorder. Every group was told that the experiment would consist of two sessions with the second session being at a later date. It was explained that the second session would be similar to the first session except that the second session would involve much more money.

All subjects were told that this was an experiment in group decision making. They would first be required to make three decisions individually and then come to a unanimous group decision for each of the three decisions.

The intellectual-problem solving items of Wallach, Kogan, and Bem (9) were utilized, as well as their procedure in this study. Subjects were asked to decide at what difficulty level for math, analogies, and antonym questions they would prefer to answer. The more difficult the question the more money that could be won. If the questions were answered incorrectly then the subjects would receive no money. The items ranged in difficulty levels from 10 percent to 90 percent and the pay-off from $.40 to $2.00 with increments of $.20 for each 10 percent increase in difficulty level. Before they made their individual decisions for the three areas, they were first given some practice questions in math, analogies, and antonyms to acquaint themselves with the difficulty levels. The practice questions were those that had been used by Wallach, Kogan, and Bem. After the subjects attempted the practice questions, they were given the correct answers by the experimenter to give them some indication as to how well they did. Then followed the individual and group decisions with the instructions that one person, who would be randomly chosen (by a pick of cards), would attempt to answer one question from one of the three areas. If the question was answered correctly then all members of the group were given the amount indicated by the difficulty level. *S*s, then, did not know who would answer the question or from which of the three areas the question would be taken.

A postexperimental questionnaire was used in an attempt to discover the effectiveness of the manipulations. After the experiment was over the *S*s were debriefed and told there would be no second session. They were asked not to discuss the experiment with anyone until the study was completed.

3. *Experimental Conditions*

a. Condition I. This condition involved only the four *S*s in the group. After they made their group decisions, one man who was randomly chosen by a pick of cards, attempted a question from one of the three areas. For example, if the group had decided to try the 80 percent, 90 percent, and 60 percent difficulty levels for math, analogies, and antonym questions respectively and were presented with an analogies question, each group member received $2.00 if the 90 percent difficulty question was answered correctly, if the question was missed, no one received any money. The area question had been randomly picked by the experimenter before the experiment.

b. Condition II. This condition was similar to the first condition with the exception that subjects were told, "Since committee members usually represent other people and the decisions of these committees affect other people, such will be the case here. What you decide on these problem-solving questions will affect four other students, as well as yourselves. Look upon yourselves as decision makers and the four other students as your constituents. These constituents are participating in another part of the experiment and will not be present when you make your decisions. But in order to let them know how you decided we are going to tape your discussion. Remember now, whatever you win they will be given the same amount. If you do not win anything they will be given nothing. For example, if you win on a 90 percent difficulty level question you will be given $2.00 each. The constituents will also be given $2.00 each. On the other hand, if you do not win any money then they do not win any money." (To emphasize this manipulation, subjects were asked to indicate what level they thought the constituents would want the group to play for.) This was done during the individual decision for the three areas. In addition, the experimenter reminded the subjects before each discussion that they were deciding for thir constituents as well as themselves.

c. Condition III. This condition was similar to the second condition but *S*s were told that "Whether you are going to be decision makers or constituents in the second session is dependent on how the constituents rate you on your decisions for this session. Let me explain how this works. After this session the constituents well listen to the tape of your discussions and will be asked to indicate how satisfied they are with the decision you have made. At this point they will not be told what the ratings are for except to see if they are satisfied with the decisions. *But,* if the ratings are high (they are satisfied) then in the second session you again will be the decision makers. So remember that in the second session whether you are constituents or decision makers is dependent on the ratings you receive from the constituents for this session."

It was emphasized to groups in Conditions II and III that the constituents were necessary in order to simulate group decision making as it usually occurs in the "real world." They were therefore to consider the constituents when making their decisions.

C. RESULTS

An analysis of variance of the performance of the subjects on the practice items was made. The overall *F* was less than 1 indicating that there was no difference among the three conditions on the practice questions. A related *t test* for the three conditions testing the difference from individual to group decisions over the three problem-solving areas indicates that the only condition to demonstrate a significant shift was Condition III. This is the condition where subjects were deciding for themselves and their constituents with the belief that they could come back for a second session as decision makers if the constituents were satisfied with their decisions. This condition showed a significant *cautious* shift significant at the .02 level. The absence of any shift for Condition II where the subjects were also deciding for themselves and their constituents would appear to rule out the possibility that responsibility for others was the factor for the conservative shift found in Condition III.

In Conditions II and III subjects were asked when making their initial decisions on the problem-solving items to also indicate what level they thought the constituents wanted them to choose. In comparing initial decisions and perceptions of constituent choices it was found that in both instances the subjects chose to go for more difficult questions even though they did not think that is what their constituents would want them to do. The difference for Condition III is significant at the .01 level. This is the condition that manifested a significant cautious shift. In other words, the group decisions moved in the direction that they perceived the constituents would want them to. The finding is somewhat different from that which has been found by Hinds (3) and Wallach and Wing (11). In those studies, dilemma items were used and the difference was between what a decision maker chose and what he perceived others in his position would choose.

D. Discussion

The significant cautious shift for Condition III deserves special attention. This condition had subjects deciding for themselves and their constituents, with instructions that they could come back for a second session. In the second session, whether the subjects would be decision makers or constituents depended on the ratings they received from the constituents. Since Condition II, which was similar except that *S*s believed the second session would be similar to the first session did not show a shift, it would appear that deciding for others was not the reason for the conservative shift. The cautious shift could in part be due to the desire of subjects to strengthen their hold on their positions as decision makers. Since the postexperimental questionnaire showed that most subjects preferred to come back for a second session and in the role of decision makers, they may have reached a group decision in such a manner as to please their constituents and receive high ratings. This explanation is logical in that the direction that the groups took in Condition III was the direction they perceived as most desired by their constituents.

In addition, the subjects believed that if they were overthrown they would have to face each other as constituents in the second session. This could have had a dampening effect in taking any risks. An individual in this situation may not want to be too risky because he will have to face the consequences of his decision at a later time if the decision ended in failure.

It should be noted that the "risky shift" was not found at all in this study. For the three conditions in this study the subjects were confronted with payoffs that increased at a constant rate, whereas previous studies presented pay-offs that increased at an increasing rate. For example, in this study the decision to move from the 80 percent difficulty level to the 90 percent involved pay-offs of $1.80 to $2.00. The Kogan and Wallach pay-offs for the same difficulty levels involved a move from $.75 to $1.50 or a 100 percent increase in reward. The difference in pay-off rate, of course, affects the expected value of any one decision. It has been found by Marquis and Reitz (6) and Hartnett (2) that the expected value is an important factor in determining whether a risky shift will or will not occur.

E. Summary

This study represented an attempt to determine the effects of constituents on group risk taking. The only condition to demonstrate a "shift" from individual to group decisions was that condition where subjects were told constituents had the power to overthrow them. This condition showed a significant cautious shift ($p < .02$).

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AUTHOR INDEX

Al-Issa, Ihsan 156
Andrews, Henry B. 127
Baumeister, Alfred A. 181
Berry, Franklin M. 181
Boll, Thomas J. 169
Brown, Fred 229
Cautela, Joseph R. 257
Coles, Gary J. 79
Cormier, William H. 127
Cull, John G. 203
Doll, Richard E. 9
Dowell, L. 39
Dreistadt, Roy 157
Dwyer, Francis M. 219
Fiebert, Martin S. 3
Finley, William W. 43
Fisher, Dennis F. 67
Flapan, Dorothy 193
Fletcher, R. 39
Gozali, Joav 207
Guerney, Bernard G., Jr. 261
Hardy, Richard E. 203
Hartnett, John J. 273
Hellebrandt, E. 271
Husted, J. 173
Isaacson, Randall M. 29
Jacobus, Kenneth A. 33
Kooker, Earl W. 165
Lachman, Sheldon J. 119
Laforge, Hubert 89
Love, Craig T. 33
O'Connell, Mary 261
Orpen, Christopher 217
Osgood, Shirley W. 253
Phillips, Victor K. 223
Prescott, James W. 189
Remington, Robert J. 17
Sapp, Gary L. 127
Schroeer, Ruediger S. 193
Silverman, Bernie I. 141
Sloan, Jack 207
Stinson, John E. 271
Stone, Leroy A. 79
Stover, Lillian 261
Sturm, Israel Eli 55
Swanson, Blair 213
Terry, Roger L. 29
Thomas, Elizabeth C. 101
Thomas, Georgelle 253
Torrance, E. Paul 223
Wallin, K. 173
Walsh, Kenneth J. 257
Williams, Robert L. 127
Wish, Peter A. 257
Wooden, H. 173
Yamamoto, Kaoru 101

TABLE OF CONTENTS

A scale to measure the social distance between college students and faculty . 3
By Martin S. Fiebert

Item susceptibility to attempted faking as related to item characteristic and adopted fake set 9
By Richard E. Doll

Analysis of sequential effects for a four-choice reaction time experiment . . 17
By Robert J. Remington

Item failure and performance on subsequent items of an achievement test . 29
By Roger L. Terry and Randall M. Isaacson

A further test of Johnson's "Chunk-Code" notion 33
By Kenneth A. Jacobus and Craig T. Love

Selected personality characteristics of high school athletes and nonathletes . . 39
By R. Fletcher and L. Dowell

The effect of feedback on the control of cardiac rate 43
By William W. Finley

An attempt to dramatize the "double-bind" hypothesis of the schizophrenogenic family 55
By Israel Eli Sturm

The effects of delay interval on word recall and clustering 67
By Dennis F. Fisher

Dimensions of color vision revisited 79
By Leroy A. Stone and Gary J. Coles

The influence of random reinforcement on heart rate during extinction . . 89
By Hubert Laforge

School-related perceptions in handicapped children 101
By Elizabeth C. Thomas and Kaoru Yamamoto

Behavior in complex learning situations involving three levels of difficulty . 119
By Sheldon J. Lachman

The utility of behavior management techniques in changing interracial behaviors 127
By Robert L. Williams, William H. Cormier, Gary L. Sapp, and Henry B. Andrews

Studies of astrology. 141
By Bernie I. Silverman

Factors in the verbal and motor learning of imbeciles 151
By Ihsan Al-Issa

Schizophrenia: A new research design to study its causes and a new theory . 157
By Roy Dreistadt

The relationship between performance in a graduate course in statistics and the Miller Analogies Test and the Watson-Glaser Critical Thinking Appraisal 165
By Earl W. Kooker

Correlation of WISC with motor speed and strength for brain-damaged and normal children 169
By Thomas J. Boll

The psychological evaluation of profoundly retarded children with the use of concrete reinforcers 173
By J. Husted, K. Wallin, and H. Wooden

Measuring single-letter cue selection in paried-associate learning: A methodological note 181
By Franklin M. Berry and Alfred A. Baumeister

Sensory deprivation *vs.* sensory stimulation during early development: A comment on Berkowitz's study 189
By James W. Prescott

Assessing aggressive and friendly behaviors in young children . . . 193
By Ruediger S. Schroeer and Dorothy Flapan

Correlation between the immediate test and the Wechsler Adult Intelligence Scale verbal scale in the rehabilitation setting 203
By John G. Cull and Richard E. Hardy

Reflections on the categorization of human excellence 207
By Joav Gozali and Jack Sloan

Note on the relationship of ordinal position, dogmatism, and personal sexual attitudes 213
By Blair Swanson

Prejudice and adjustment to cultural norms among English-speaking South Africans 217
By Christopher Orpen

Effect of knowledge of objectives on visualized instruction 219
By Francis M. Dwyer

Divergent thinking, remote associations, and concept attainment strategies . 223
By Victor K. Phillips and E. Paul Torrance

Changes in sexual identification and role over a decade and their implications 229
By Fred Brown

College students' performance on the "fruit-tree experiment" under varied conditions of color availability 253
By Georgelle Thomas and Shirley W. Osgood

The use of covert reinforcement in the modification of attitudes toward the mentally retarded 257
By Joseph R. Cautela, Kenneth J. Walsh, and Peter A. Wish

Measurements of acceptance, allowing self-direction, involvement and empathy in adult-child interaction 261
By Lillian Stover, Bernard G. Guerney, Jr., and Mary O'Connell

The effects of T-group training on business game results 271
By E. T. Hellebrandt and John E. Stinson

Group risk taking and constituency power 273
By John J. Hartnett

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VOLUME 45—January-June, 1952

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rsonality characteristics of selected disability groups—D. N. Wiener

Genetic Psychology Monographs *(continued)*

VOLUME 46—July-December, 1952

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VOLUME 47—January-June, 1953

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VOLUME 48—July-December, 1953

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Genetic Psychology Monographs *(continued)*

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(Manuscripts are printed in the order of final acceptance)

The generality of learning differences among inbred mouse strains . . . 3
By John Streng

The effects of motivation on cardiac activity 11
By Jerry R. Levinson and Walter D. Fenz

The relationship between extraversion and tough-mindedness in a "tough-minded" culture 27
By Christopher Orpen

Human performance in a three-axis tracking problem using two distinct hand controller configurations 31
By Ruel E. Jones and Darhl M. Pedersen

Adolescents' perception of themselves and adults in Hutterite communal society 39
By Shirin Schludermann and Eduard Schludermann

(OVER)

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Biasing factors affecting estimates of fertility rates of schizophrenics 49
By Ellen Lane

The use of technical and nontechnical language in communication . . . 65
By Robert V. Walker and Douglas K. Chalmers

The effect of cultural factors on the relationship between prejudice and personality 73
By Christopher Orpen

The relationship between liking and perceived self-disclosure in small groups 81
By Michael H. Kahn and Kjell E. Rudestam

Estimation as a function of density and contrast 87
By E. P. Horne and M. Allee

Some comments on the psychology of the psychologist 95
By Edith Weisskopf-Joelson

The projected brain illusion 115
By Frank M. du Mas and Michael E. du Mas

Social schemas: A developmental study 119
By Betsy Worth Estes and David Rush

Industrial psychology in *Psychological Abstracts*, 1927-1969 125
By H. Meltzer

Published as a separate and in *The Journal of Psychology*, 1971, 78, 3-9.

THE GENERALITY OF LEARNING DIFFERENCES AMONG INBRED MOUSE STRAINS*[1]

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JOHN STRENG

A. INTRODUCTION

Differences in performance between inbred mouse strains have been reported for a variety of learning situations (1, 6). Most of the individual studies have dealt with one particular learning situation and usually only a single phase (acquisition) of the learning process was studied. It may be argued that a study of the performance of a number of inbred strains in several learning situations and for several phases of the learning process may provide, at least in part, an answer to the question of whether or not a general, nonspecific ability to learn exists in animals. A perusal of the behavior genetics literature appears to indicate that no consistent strain picture exists; i.e., strain rank orders are specific to a particular situation. This finding may in part be due to the different conditions of testing and discrepant laboratory practices across the various studies.

The study reported here attempted to investigate the performance of four inbred mouse strains in two very different learning situations. Several aspects of learning behavior were studied during various phases of the learning process. In addition, an attempt was made to study the spontaneously emitted behavior of these mice in one of the situations, since such motivational differences may well contribute to any differences in learning performance between inbred mouse strains (5).

B. METHOD

1. *Subjects*

Ten mice of each sex of the following four inbred strains were used: A/Ibg, BALB/c/Ibg, C57BL/6/Ibg and DBA/2/Ibg. The origin and genetic characteristics of these mice have been described (4). The animals were born and raised in the specific pathogen free (SPF) laboratory of the Institute for Behavioral Genetics at the University of Colorado. At the beginning of testing *S*s were between 65 and 70 days of age. They had been tested in the open field at 40 to 45 days of age for 20 minutes. The mice were maintained under standard laboratory conditions of temperature (73° ± 2° F) and lighting (7:00 a.m.—7:00 p.m. light). They were housed in metal pans and food and water was available to them at all times. The females were studied in the aversive situation and the males in the appetitive situation.

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2. *Apparatus and Testing Procedures*

a. Wheel-turn avoidance learning. The wheel-turn box used for this study was similar to the one described by Zerbolio (7). It measured 13.5 × 16.5 × 16.5 cm and the wheel was covered with fine mesh steel screening. A six-watt bulb mounted on the lid served as the conditioned stimulus and it was followed by a 1 ma scrambled shock through the grid floor five seconds after CS onset. A one-half turn of the wheel terminated both the CS and UCS. The intertrial interval varied randomly from 10 to 50 seconds in five-second increments with a mean of 30 seconds. The number of wheel revolutions and the number of shocks received were recorded on counters automatically. Ten operant (CS only) trials were given and during this period the number of grooming bouts and the number of rearing acts were also recorded. This phase was followed immediately by 100 acquisition trials (divided into five blocks of 20 trials) and, finally, 40 extinction trials. The number of fecal boli and urine pools were recorded at the end of the entire period.

b. Maze learning. A Lashley III maze adapted for mice was used. Its dimensions were 46 × 16 × 8 cm and it was in all essentials similar to that described by Krivanek and McGaugh (2). The mice received pretraining for four days in a straight alley, after which they were given one trial a day for seven days. The final three days the running pattern was reversed; i.e., the original start box now served as the goal box and *vice versa*. *S*s were maintained at 85-90% of their original bodyweight throughout the various training phases. The reward consisted of wet mash, which *S* was allowed to consume in the goal box for one minute upon completion of a trial. Errors were defined as entries into or exits out of one of the eight *cul de sacs* and these were automatically recorded with eight Grason Stadler drinkometers on an EA-recorder. The running times were also recorded.

All apparatus was cleaned with water and paper towel between individual mice. The animals were tested between 9:00 a.m. and 5:00 p.m. with regular room illumination prevailing.

C. RESULTS

Analyses of variance were done separately for the three phases of wheel-turn avoidance learning. The number of wheel revolutions during the operant phase differed significantly between strains ($F = 5.59$, $p < .01$). The C57BL/6 mice turned the wheel approximately five to 10 times as often as any one of the other three strains. However, this was not done preferentially during the presentation of the light stimulus. The grooming and rearing scores also were significantly different between strains. Table 1 provides a summary of these data and it also indicates the corresponding F values.

TABLE 1
MEAN FREQUENCY OF REARING, GROOMING, AND ELIMINATION MEASURES FOR THE FOUR INBRED MOUSE STRAINS IN THE WHEEL-TURN BOX

Strain	Rearing	Grooming	Urination	Defecation
A	14.8	2.8	1.8	14.9
BALB/c	21.5	2.5	2.3	9.5
C57BL/6	47.2	.4	2.2	20.3
DBA/2	13.8	1.1	1.6	21.1
F value	20.9*	11.3*	.8	17.1*

* $p < .01$.

The learning curves for the acquisition and extinction phases are presented in Figure 1 for both the number of wheel revolutions and the number of avoidances. The differences between strains in number of wheel-turns were highly significant both during acquisition ($F = 5.9$, $p < .01$) and extinction ($F = 4.9$, $p < .01$). The effect of training was significant both for acquisition ($F = 25.9$, $p < .01$) and extinction ($F = 18.4$, $p < .01$). The Strain × Trial-block Interaction approached significance during acquisition ($F = 2.0$, $p < .05$), but not during extinction for the wheel-turn measure.

The number of shocks received differed significantly between strains during acquisition ($F = 7.3$, $p < .01$). Similarly, there was a significant difference in the number of trials during extinction on which no conditioned avoidance response was made ($F = 12.1$, $p < .01$). The effect of training also was significant for this measure during acquisition ($F = 25.9$, $p < .01$) and extinction ($F = 21.0$, $p < .01$). Most interestingly, the Strain × Trial-block Interaction was significant during acquisition ($F = 5.2$, $p < .01$), indicating significant differences between the four inbred mouse strains in the rate of learning. The elimination scores are presented in Table 1. It may be seen

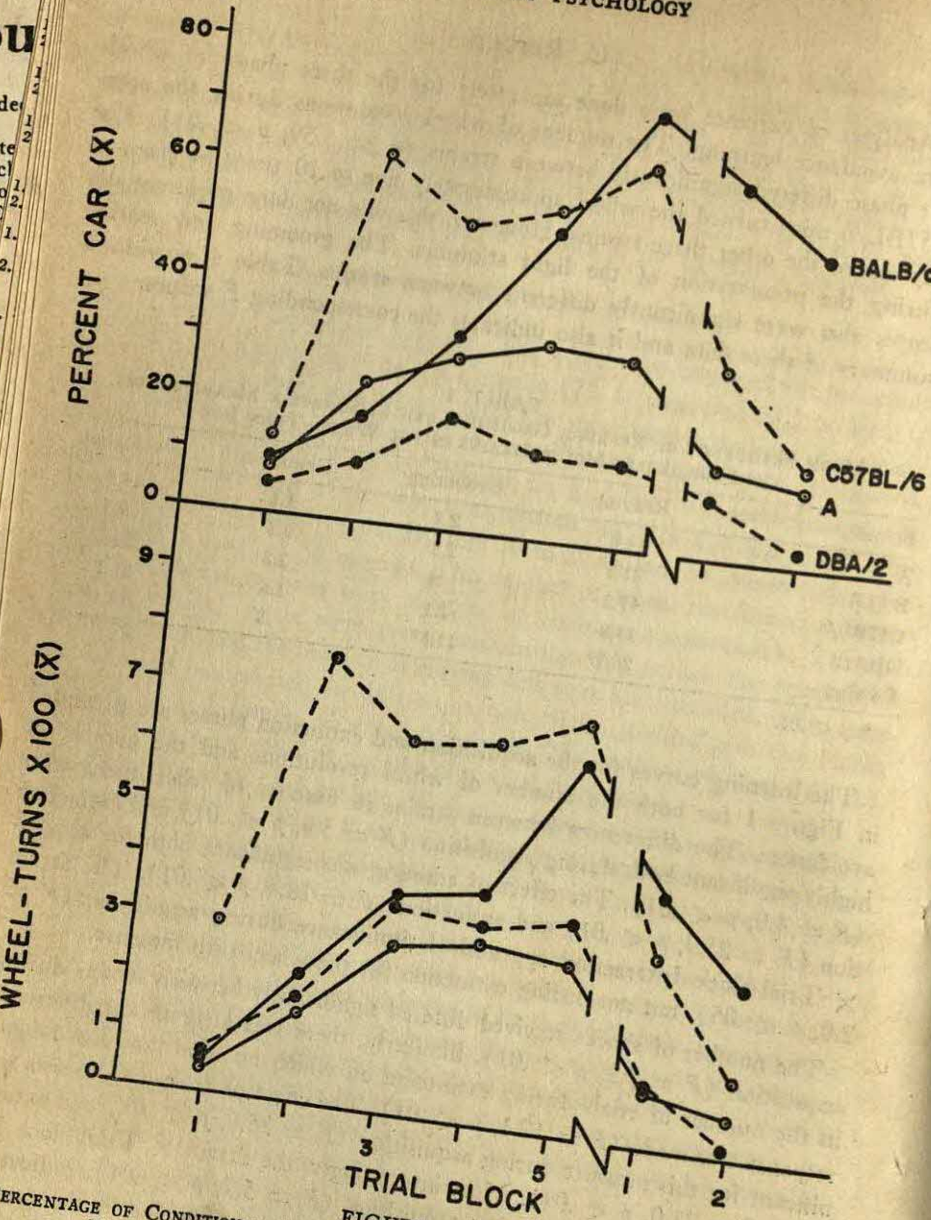

FIGURE 1
PERCENTAGE OF CONDITIONED AVOIDANCE RESPONSES (TOP) AND NUMBER OF WHEEL REVOLUTIONS (BOTTOM) DURING ACQUISITION AND EXTINCTION

that the strains differed significantly in the amount of defecation, but not in the frequency of urination.

Analyses of variance with one repeated measure were performed separately for the acquisition and reversal phases of maze learning. Figure 2 presents the learning curves for both the total number of errors and the running time. The strains differed significantly in the number of errors made during acquisition ($F = 4.97$, $p < .01$). The effect of training also was highly significant ($F = 24.13$, $p < .01$), but the Strain × Trials Interaction was not significant. No significant differences were found during reversal training, even though the A mice made consistently fewer errors on all three days.

The running times during acquisition differed significantly ($F = 4.94$, $p < .01$) and the effect due to Trial also was significant ($F = 16.16$, $p < .01$). Furthermore, the Strain × Trial Interaction was significant ($F = 2.12$, $p < .01$) indicating that the four mouse strains differed in the rate of learning for this measure. Clearly, the DBA/2 mice showed a relatively greater drop than the other strains, while the C57BL/6 strain exhibited the least amount of improvement. There was no significant decrease in running time

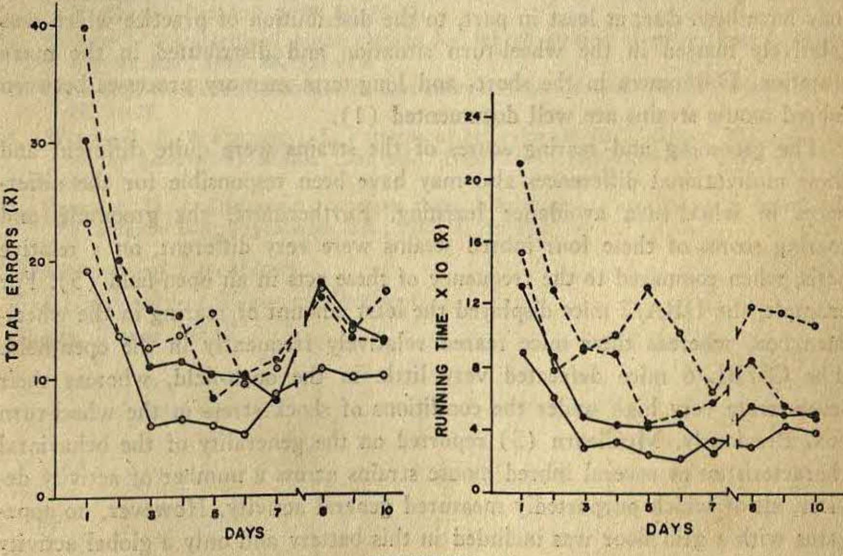

FIGURE 2
TOTAL NUMBER OF ERRORS (LEFT) AND RUNNING TIME IN SECONDS (RIGHT) DURING ORIGINAL MAZE LEARNING AND REVERSAL TRAINING
(For symbols see Figure 1.)

during reversal learning, but the differences were significant between strains ($F = 4.56$, $p < .01$). The A mice apparently were least disturbed by the reversal of the running pattern.

D. Discussion

The large differences in performance between the inbred mouse strains corroborate a large volume of earlier work. Presumably these differences are due to differences at a large number of unspecifiable loci between these strains as a result of the inbreeding and the concomitant elimination (or retention) of particular alleles in the various strains.

It is clear from Figures 1 and 2 that the rank order of the inbred mouse strains is a function of both the situation in which these strains are studied (aversive *versus* appetitive) and the particular performance measure employed. Most significantly these data provide further evidence indicating that relatively specific learning capacities are inherited, such that it is virtually impossible to make any prediction about the performance of a particular inbred strain in some situation from a knowledge of its performance in some other learning situation. The lack of similarity in performance in the two situations may have been due, at least in part, to the distribution of practice which was relatively massed in the wheel-turn situation and distributed in the maze situation. Differences in the short- and long-term memory processes between inbred mouse strains are well documented (1).

The grooming and rearing scores of the strains were quite different and these motivational differences also may have been responsible for the differences in wheel-turn avoidance learning. Furthermore, the grooming and rearing scores of these four inbred strains were very different, on a relative basis, when compared to the frequency of these acts in an open-field (5). For example, the DBA/2 mice displayed the least amount of rearing in the wheel-turn box, whereas these mice reared relatively frequently in the open-field. The C57BL/6 mice defecated very little in the open-field, whereas their scores were very high under the conditions of shock stress in the wheel-turn box. Previously, McClearn (3) reported on the generality of the behavioral characteristics of several inbred mouse strains across a number of activity devices, all of which purportedly measured general activity. However, no apparatus with a grid floor was included in this battery and only a global activity index was used. The discrepancies between open-field exploration and the behavior in the wheel-turn box, as reported here, severely hamper any attempts to relate the phenotypes of open-field activity and learning behavior.

E. SUMMARY

The learning behavior of four inbred mouse strains (A, BALB/c, C57BL/6 and DBA/2) was investigated in a wheel-turn avoidance and a maze situation. Several phases of learning were studied and a variety of measures were taken in an attempt to determine whether learning abilities are inherited rather specifically or whether some general learning capacity is transmitted. Significant differences in learning between strains were observed; the rates of learning also were different for several learning measures. The strain rank-order was a clear function of the particular learning situation (appetitive *vs.* aversive) and also of the particular measure employed. It was concluded that learning ability in the mouse is inherited as a set of independent and rather specific capacities.

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THE EFFECTS OF MOTIVATION ON CARDIAC ACTIVITY*

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A. INTRODUCTION

Following the traditional notions about the autonomic behavior of a person in a stressful or arousing situation, one would expect physiological variables which measure "arousal" to be highly correlated. There are, however, very few studies in which correlations between autonomic variables are high enough to warrant the assumption of a uniform dimension of autonomic arousal. In fact, the results of an increasing number of studies indicate that different stimulus situations consistently produce different patterns of autonomic responsiveness so that while some physiological measures may show high reactivity, others, at the same time, may show a decrease in reactivity.

Lacey (7) employed heart rate and galvanic skin response measures to study four stimulus conditions labelled "visual attention," "empathic listening," "thinking," and "withstanding pain." The results showed definite directional fractionation of the physiological measures: palmar conductance increased under all four conditions, while heart rate increased only under the conditions of "thinking" and "withstanding pain." When visual attention and emphatic listening were called for, the two measures showed opposite directions on the arousal continuum.

In the preceding, as well as in other similar investigations, Lacey *et al.* (9) have found cardiac deceleration in those situations which required that the subjects note and detect incoming stimulation. Cardiac acceleration, on the other hand, was found in those situations in which the stimulation was unpleasant (cold pressure test) or in those situations in which external distractions would interfere with internal cognitive events (mental arithmetic). Lacey (7) also suggests that cardiovascular activity indirectly influences the organism's sensitivity to environmental stimulation. In particular, he has proposed that cardiac deceleration permits increased ease of "environmental intake" and cardiac acceleration facilitates "rejection of the environment."

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If cardiovascular changes can be regarded as instrumental acts of the organism which function to increase or decrease sensory sensitivity, we can assume that there will be a relationship between cardiac activity and the degree of a subject's motivation to process environmental inputs (7). In a recent reaction time study (8), those subjects who were motivated as a result of being given immediate knowledge of their results, showed greater decreases in heart rate level, smaller increases in early acceleration and larger increases in cardiac deceleration than nonmotivated subjects. Motivation tended to have a greater effect upon cardiac deceleration than upon cardiac acceleration. "All relationships were in the direction predicted from the theory that cardiac decelerations are facilitatory and cardiac accelerations are inhibitory of sensory-motor integration" (8).

It has long been recognized that when a person is engaged in a task which he construes as being relevant to his own achievement needs, he shows marked autonomic reactivity. The cardiac response seems to be particularly sensitive to motivational variables, especially when the task involves mental concentration. Spence and Spence (11) demonstrated that when given instructions which imply that their performance reflects a valued characteristic, such as intelligence for the college student, subjects will tend to increase their attention to the task at hand and improve their performance. The authors also note that instructions which stress the importance of doing well may also arouse anxiety which may, in some highly anxious subjects, interfere with performance.

Since in the present study subjects were required to verbalize in their task, a concomitant effect due to verbalization by itself cannot be ignored. Campos and Johnson (1) and Johnson and Campos (5) have found that attentional tasks accompanied by verbalization produce cardiac acceleration, while similar tasks without a requirement to verbalize produce cardiac deceleration.

The present study is concerned with the effect of motivation upon cardiac activity in anticipation of an attentional task, during the performance of the task itself, accompanied by overt verbalization, and following completion of the task.

B. METHOD

1. *Subjects*

The study included 30 male University of Waterloo undergraduates who were asked to participate in the experiment as part of a course requirement. Subjects (*S*s) were randomly divided into three groups, one receiving high, one low, and one "neutral" motivational instructions.

2. *Apparatus*

Heart rate (HR) recordings were obtained from a two channel Type RP Beckman dynograph with joined Type 9806A AC, and Type 9857 cardiotachometer (CT) couplers. Beckman biopotential skin electrodes, filled with Beckman electrode paste, were attached to the *S*'s sternum by means of adhesive collars. A ground electrode was attached to the shoulder. The skin under the areas of electrode placement was swabbed with rubbing alcohol and treated with Sanborn Redux electrode paste.

A Kodak Carousel 800 slide projector, located in the experimental room, presented the visual stimuli on the wall directly in front of *S*. The presentation of the stimuli was controlled by a Gerbrands 8 mm tape programmer. A standard telegraph key was attached to the left arm of the *S*'s chair; when pressed it broke a circuit leading to a Standard electric timer (Type S-1), which had been activated by the tape programmer, and thus allowed measurement of response time to the stimulus. A small, yellow 24 volt reflector bulb was placed on the wall in front of *S* and was turned on by a Hunter timer (model 111-B) in conjunction with an *S*'s response.

A Fannon intercom system, consisting of a remote (Model FIC), a master (Model F13), and a power pack unit (Model PSF) was used for communication between the equipment and experimental rooms. The experimental room, located adjacent to the equipment room, was shielded and sound attenuated.

3. *Procedure*

Each *S* was escorted to the experimental room and was told that he was going to participate in a study concerning heart rate. Electrodes were then attached, and *S* was asked to sit back and relax while the equipment was being calibrated. Following calibration, the experimenter *(E)* obtained a three-minute pre-experiment recording of basal heart rate. After this, *E* returned to the experimental room and read the instructions which, for both the high and the low motivation groups, were as follows: "You will be presented with three types of slides, each of which will be presented 30 times. A dark slide (from here on referred to as the "anticipatory" slide) tells you to get ready. A slide containing a number of Xs (from here on referred to as the "experimental" slide) will then follow and you are to count the number of Xs; when you are finished counting you are to press this lever and a "clear" slide will then appear. Ten seconds after this clear slide appears, this light in front of you on the wall will flash, which is a signal for you to tell me how many Xs you have counted."

In addition to these straightforward, task oriented instructions, the 10 *S*s in the "high-motivation" group were told that "from earlier research we know that there may be a definite relationship between a person's speed in counting under pressure and his intelligence. In other words, we believe that the person who can perform under pressure with high speed and accuracy, has a basic ability which is likely to benefit him in everyday life, especially in the academic areas. Thus, after computing your speed and accuracy scores from this experiment, we will be able to compare them with your school grades to see if, in fact, you are performing as would be predicted." No additional instructions were given to the low-motivation group. The instructions to the control *S*s were identical to those received by the "low-motivation" *S*s, except that instead of counting the Xs, the control *S*s were asked to "count to yourself slowly from 1 to 25." In other words, the control group was not required to "take in the environment" but had only to verbalize.

After the 30th trial *E* informed *S* that the experiment was over but that he should remain seated quietly for another few minutes. During this time a postexperiment recording of basal heart rate was obtained. The electrodes were then removed and the general purpose of the study was explained to *S*.

4. *Experimental Design*

Thirty *S*s were randomly divided into three equal groups and were run in random order. Each *S* was given a total of 30 trials.

For the first eight seconds of each trial a dark slide was presented. This was followed by the "experimental" slide; there were approximately 100 Xs on each of these slides. Following completion of counting, the pressing of the telegraph key replaced the "experimental" slide with the "clear" slide which was presented for a random interval averaging 30 seconds. After the first 10 seconds of this interval a light flashed. This light signalled the *S*s in the low and high-motivation groups to report the number of Xs that they had counted. Following this random interval, the next trial began with the presentation of a dark slide.

5. *Data Quantification*

For the initial analysis of the data, the direct HR was scored by hand. Each trial was divided into three sections and the number of beats in each section were counted. Section 1 corresponds to the eight seconds of the "anticipatory" slide. Section 2 corresponds to the first 10 seconds of the "experimental" slide. Section 3 represents the first 10 seconds of the "clear" slide. The 30 trials were grouped into six blocks of five trials each for the analyses.

In order to obtain second by second HR changes, the CT output was scored on a Benson-Lehner Oscar Model F analogue to digital converter. The Oscar output was channeled into an IBM model keypunch which produced the digital output on computer cards. A simple data conversion program changed the Oscar scores into HR scores. For this analysis each of the 30 trials was segmented into four periods. Period 1 consists of the eight seconds of the "anticipatory" slide. Period 2 consists of the first eight seconds immediately following Period 1—i.e., the first eight seconds of the "experimental" slide. Period 3 consists of the last eight seconds of the "experimental" slide. Period 4 consists of the eight seconds immediately following Period 3, or the "clear" slide period.

The number of seconds spent in counting Xs during each trial was calculated for *S*s in both low- and high-motivation groups. Also recorded were the number of errors made by these *S*s in counting the number of Xs on each "experimental" slide.

C. RESULTS

The results on direct heart rate corresponded closely to the results obtained from CT recordings and since they do not add appreciably to the findings, were not included in this report.

The results of the CT analyses are presented in four sections corresponding to the four specified time periods. Period 1 corresponds to the eight second interval immediately preceding the presentation of the "experimental" slide during which a dark "anticipatory" slide was presented. Period 2 refers to the first eight seconds during which the "experimental" slide was presented. Period 3 refers to the last eight seconds during which the "experimental" slide was presented. Period 4 corresponds to the first eight seconds immediately following the termination of the "experimental" slide during the initial period of the "clear" slide.

1. *Period 1*

In Figure 1 it may be seen that the typical response of all three groups during this time interval was a marked cardiac acceleration followed by cardiac deceleration. The reliability of this finding was confirmed in an analysis of variance which included all three groups and yielded a highly significant main effect for *Time*, $F(7, 189) = 20.34$; $p < .0001$. Although the average response of the three groups did not differ significantly, there was a significant interaction of *Groups* × *Time*, $F(7, 189) = 20.34$; $p < .0001$. Pairwise analyses of variance between groups (i.e., high-motivation *versus* low-motivation, high-

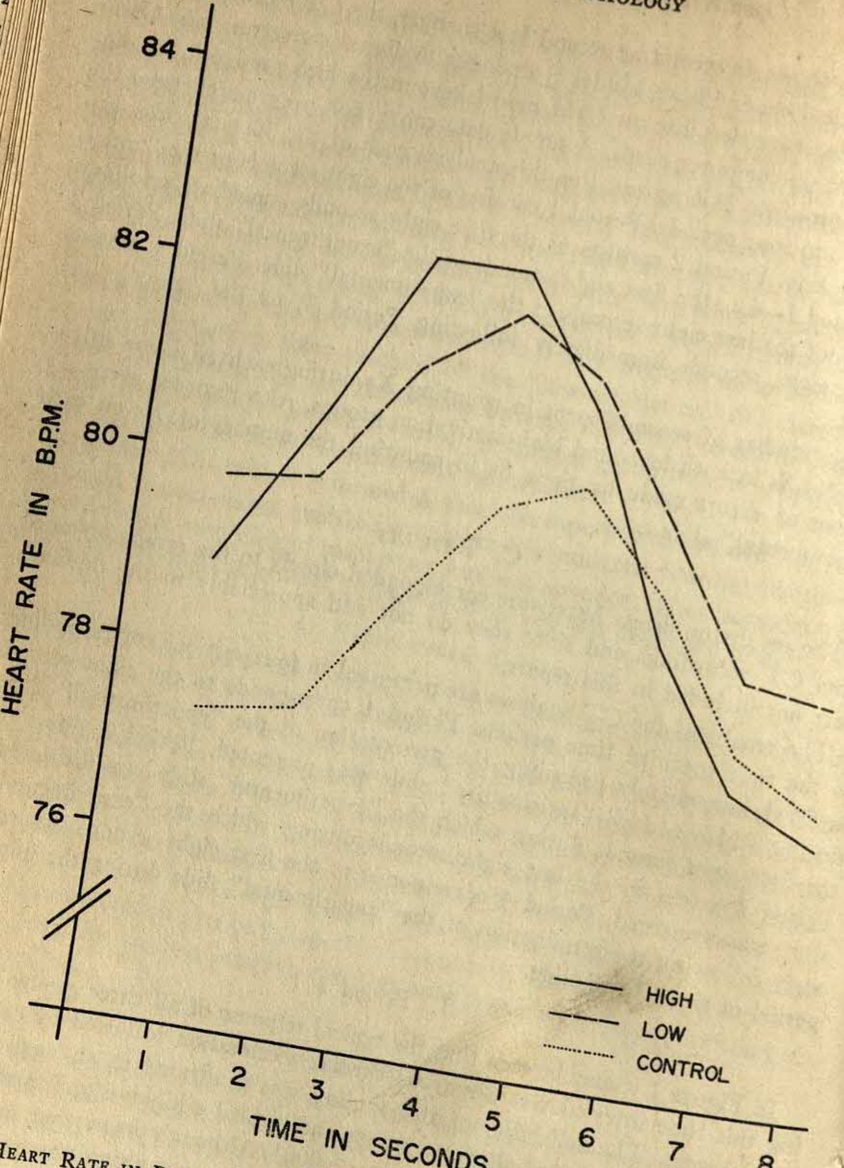

FIGURE 1

HEART RATE IN BEATS PER MINUTE AS A FUNCTION OF TIME FOR PERIOD 1

motivation *versus* control group, and low-motivation *versus* control group) indicated that the *Groups* × *Time* interaction represents a significant difference only between the high-motivation group and the control group, $F(7, 126) = 5.12$; $p < .0001$.

It may further be seen in Figure 1 that the high-motivation group peaked earliest followed in turn by the low-motivation group and the control group. Furthermore, the amount of cardiac deceleration was greatest in the high-motivation group (5.5 bpm) followed in turn by the low-motivation group (3.7 bpm) and the control group (2.7 bpm).

The interaction between *Trials* × *Time* in the analysis of variance which included all three groups, was also significant, $F(203, 548) = 1.38$; $p < .0005$. Pairwise analyses of variance between groups showed that the *Trials* × *Time* interaction was significant in the comparison between the high-motivation and low-motivation groups, $F(203, 3654) = 1.24$; $p < .01$, and the comparison between the low-motivation and control groups, $F(203, 3654) = 1.36$; $p < .001$. Although highly significant, this interaction is difficult to interpret.

2. *Period 2*

It may be observed in Figure 2 that the response of *S*s in each group during this period was biphasic; i.e., an initial heart rate acceleration was followed by HR deceleration. This observation was supported by a significant main effect for *Time*, $F(7, 189) = 14.95$; $p < .0001$. Also significant was the *Groups* × *Time* interaction, $F(14, 189) = 2.46$; $p < .005$. Pairwise analyses of variance between groups showed that the *Groups* × *Time* interaction represents a difference only between the high-motivation group and control group, $F(7, 126) = 4.63$; $p < .0005$. Inspection of Figure 2 indicates that the average HR for all groups accelerated during the first four seconds of this period and then decelerated. The high-motivation group had the greatest deceleration going from a high of 85.9 bpm at second 4 to a low of 78.4 bpm at second 7. The low-motivation group decelerated less (from 84.7 bpm at second 4 to 80.6 bpm at second 8) and the control group had the least deceleration (80.0 bpm at second 4 to 78.5 bpm at second 8).

Also significant was the interaction between *Trials* × *Time*, $F(203, 5481) = 1.18$; $p < .05$. Pairwise analyses of variance between groups yielded a significant *Trials* × *Time* interaction in the comparison between the high-motivation and low-motivation groups, $F(203, 3654) = 1.20$; $p < .05$.

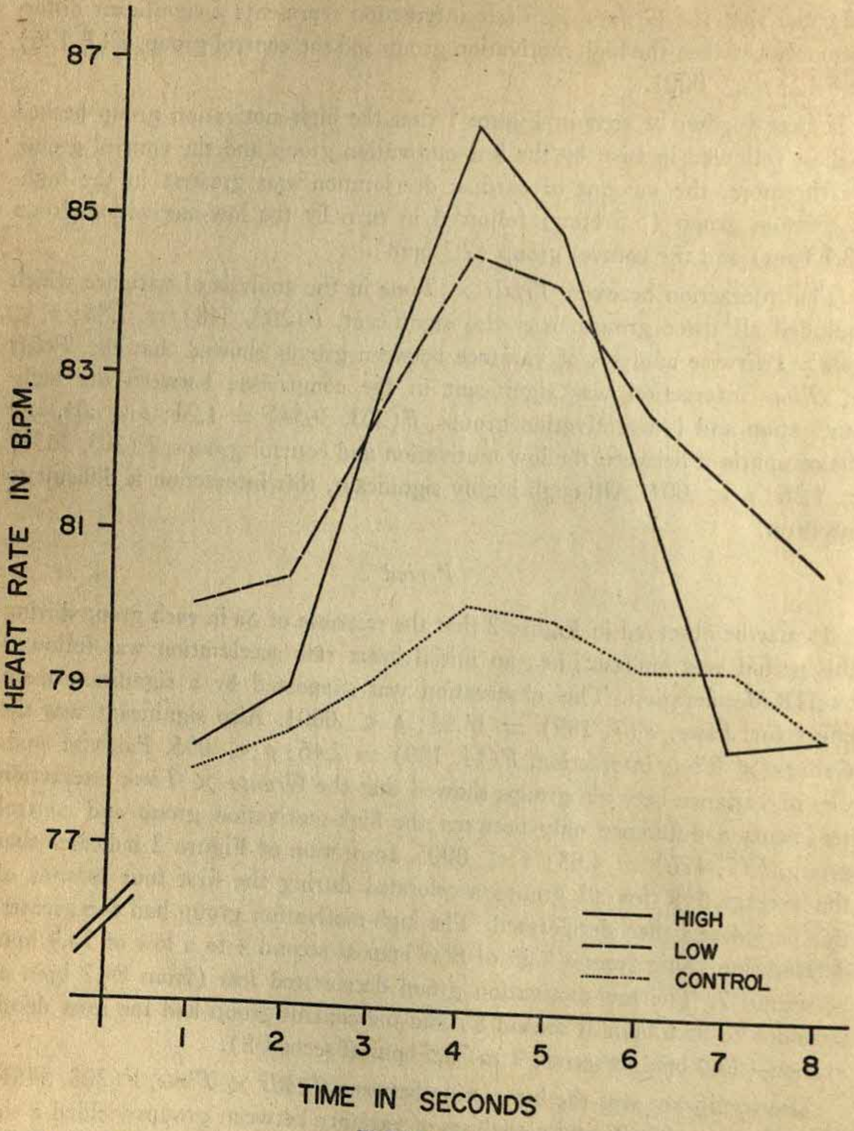

FIGURE 2
Heart Rate in Beats per Minute as a Function of Time for Period 2

3. *Period 3*

As may be observed in Figure 3, the curves for the high- and low-motivation groups run nearly parallel during this period, both groups averaging about 83.5 bpm. The control group showed a lower level of heart rate with an average of about 77.5 bpm.

There was a significant main effect for *Trials* as was observed during all four periods. This effect was due mainly to habituation. More important, however, was the significant interaction between *Groups* × *Trials*, $F(58, 783) = 1.33$; $p < .05$. This interaction, which can be seen in Figure 4, indicates that the rate of habituation is significantly related to motivational level. Pairwise analyses of variance between groups yielded a significant *Groups* × *Trials* interaction only in the comparison between the high-motivation and the control group, $F(29, 522) = 173$; $p < .01$.

4. *Period 4*

As may be seen in Figure 5, all three groups showed a similar response pattern during this interval: namely, an initial cardiac acceleration followed by four seconds of cardiac deceleration. Analysis of variance across the three groups yielded a very significant main effect for *Time* pointing to the reliability of the findings, $F(7, 189) = 7.60$; $p < .0001$. There were no significant interactions between *Groups* × *Time*.

Pairwise analyses of variance between groups revealed a significant *Trials* × *Groups* interaction when the high-motivation and low-motivation groups were compared, $F(29, 522) = 1.57$; $p < .05$. Figure 6 illustrates the *Trials* × *Groups* interaction. Examination of Figure 6 reveals that the low-motivation group habituated more quickly and reached its lowest heart rate during trial 8 whereas the high-motivation group habituated more slowly and reached its lowest heart rate during the 24th trial.

Also significant were main effect of Trials, $F(406, 5481) = 6.32$; $p < .0001$ and the interaction between *Trials* × *Time* × *Groups*, $F(406, 5481) = 1.41$; $p < .05$.

5. *Accuracy Scores*

A direct indication of the motivational effects of the experimental instructions can be obtained through a calculation of the number of errors made by each group in counting the number of Xs presented to them. It may be assumed that the more highly motivated the *S*, the more accurate he will be in counting. The mean number of errors made by *S*s in the low-motivation

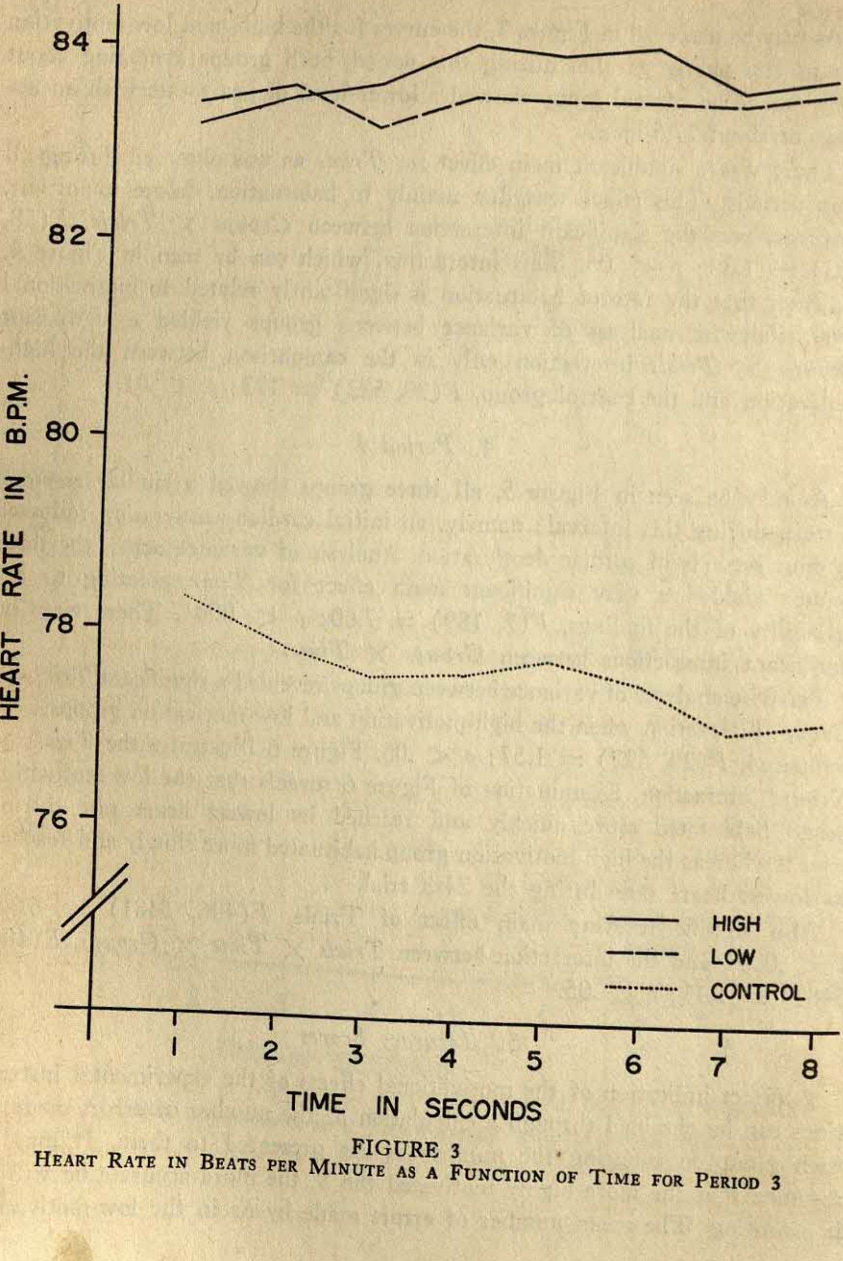

FIGURE 3
Heart Rate in Beats per Minute as a Function of Time for Period 3

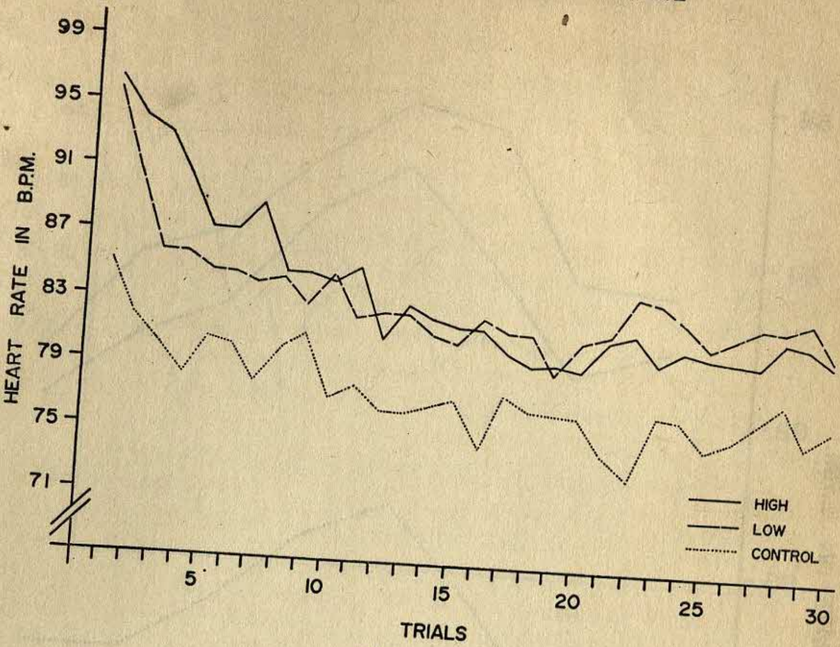

FIGURE 4
HEART RATE IN BEATS PER MINUTE AS A FUNCTION OF TRIALS FOR PERIOD 3

group was significantly greater than the mean number of errors made by *S*s in the high-motivation group ($p < .05$; one tailed test).

6. *Length of Counting Intervals*

The amount of time required for each *S* to count the Xs may be considered a function of the *S*'s motivational level since the instructions delivered to the two motivation groups placed great emphasis on speed. The mean number of seconds required was greater in the low-motivation group than it was in the high-motivation group, although this difference was not significant ($t = 1.10$; $p < .25$).

D. DISCUSSION

Although there were no significant overall differences between groups, the highly significant interactions between groups and the other variables indicate that the motivational instructions did in fact exert a substantial influence upon cardiac activity.

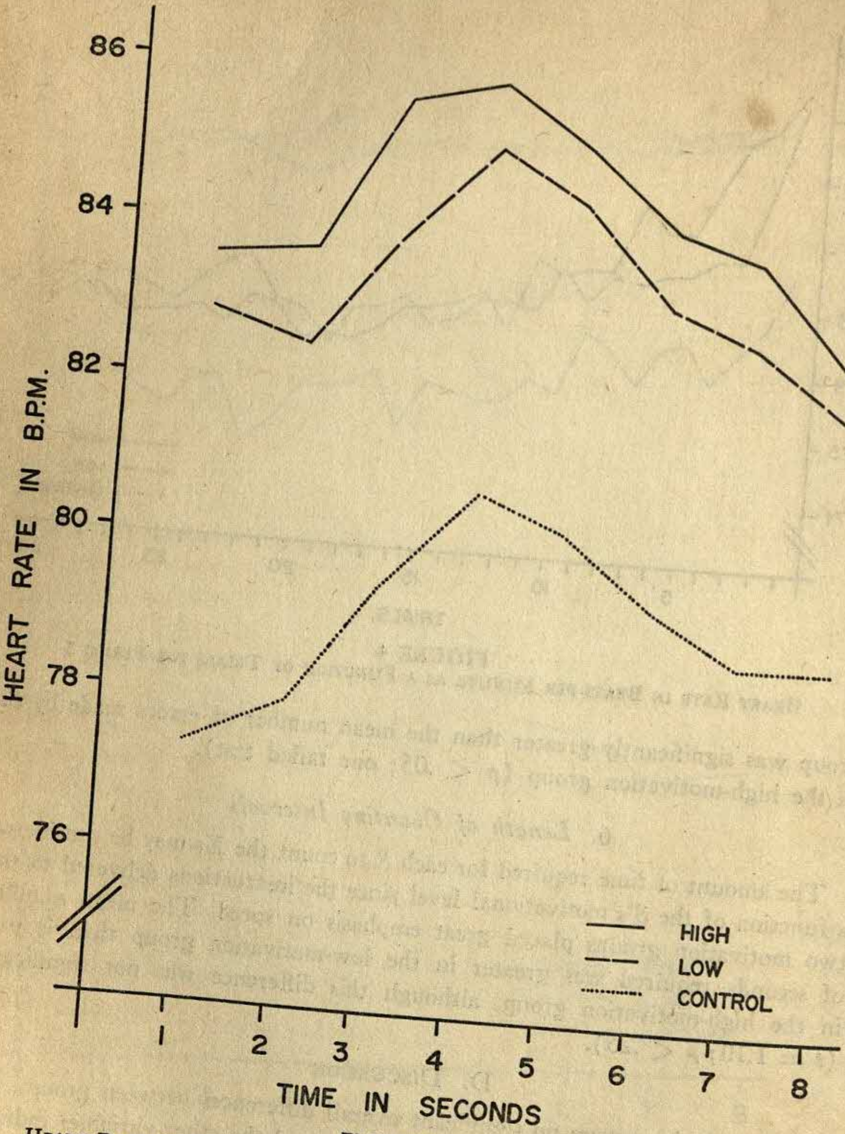

FIGURE 5
HEART RATE IN BEATS PER MINUTE AS A FUNCTION OF TIME FOR PERIOD 4

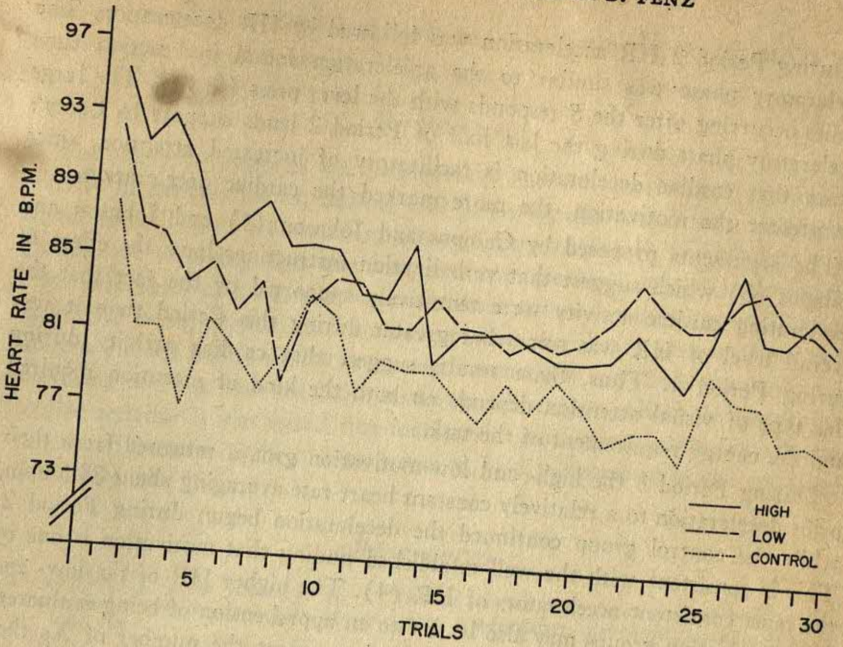

FIGURE 6
Heart Rate in Beats per Minute as a Function of Trials for Period 4

The Period 1 heart rate pattern of acceleration followed by deceleration was similar to the HR pattern observed in the foreperiod of many reaction time studies (2, 3). During the foreperiod of the RT task, the *S* is concentrating upon the detection of a signal which instructs him to respond. Period 1 of this study is similar to the RT foreperiod in that the *S* is concentrating upon detecting the onset of the experimental slide. This situation may be considered as requiring environmental intake and the Lacey theory would therefore predict a period of cardiac deceleration.

Although the general pattern of the cardiac response was the same for all groups, the amplitude of the response was largest in the high-motivation group; both the acceleratory and the deceleratory phases of the response were greatest in the high-motivation group especially during the deceleratory phase. Results almost identical to these were reported by Lacey and Lacey (8). If this deceleratory phase can be interpreted as reflecting the relationship between the attentional and the cardiovascular response, we can say that the high-motivation group was paying the most attention.

During Period 2 HR acceleration was followed by HR deceleration. The acceleratory phase was similar to the acceleration found in reaction time studies occurring after the *S* responds with the lever press (8, 10). The large deceleratory phase during the last half of Period 2 lends support to Lacey's theory that cardiac deceleration is facilitatory of increased attention, since the greater the motivation, the more marked the cardiac deceleration.

The arguments proposed by Campos and Johnson (1) and Johnson and Campos (5) which suggest that verbalization instructions have the effect of accelerating cardiac activity were tentatively supported by the fact that the overall level of HR was somewhat greater during this Period than it was during Period 1. Thus, these results suggest that cardiac activity during this type of visual attention depends on both the kind of attention required and the energy requirement of the task.

During Period 3 the high- and low-motivation groups returned from their prior deceleration to a relatively constant heart rate averaging about 83.5 bpm, while the control group continued the deceleration begun during Period 2. This is consistent with the well established finding that motivation is one of the most consistent accelerators of HR (4). The higher HR of the low- and high-motivation groups may also be due to an apprehension of being evaluated, since the *S*s in these groups were required to report the number of Xs they had counted. The fact that the control group responded with only a small cardiac deceleration during this period in which they were verbalizing (counting to themselves), argues against the Campos and Johnson (1) position that verbalization is always accompanied by a marked cardiac acceleration.

Period 4 can be seen in a manner analogous to the foreperiod in RT or time estimation studies since all *S*s were anticipating the light flash which was scheduled to occur 10 seconds after the offset of the experimental slide. The cardiac acceleration-deceleration pattern which typified this period is very similar to the findings reported in other studies (6). Although not significant, it is interesting to note that the higher the motivational level, the higher was the amplitude of cardiac activity throughout this period.

While "arousal" theory would lead us to expect the highly motivated *S* to have the highest overall HR, this study showed that motivation, in an attentional task, produces its major effect by prolonging and increasing both the acceleratory and deceleratory phases of cardiac response, with the greater effect being on cardiac deceleration. As future research specifies more clearly the relationship between HR and motivation, it may shortly be possible to use cardiac measures as dependent measures to indicate degree of motivational involvement in a given task.

E. SUMMARY

The study investigates the relationship between motivation and cardiac activity in anticipation of, during, and following the completion of an attentional task. Thirty male undergraduates were randomly divided into three groups, one receiving high, one low, and one "neutral" motivational instructions. Measures of heart rate were obtained for each subject over 30 trials, each trial being segmented into four periods for heart rate analysis. The analysis yielded highly significant group interactions with both time and trials indicating that the motivational instructions did exert a reliable influence upon cardiac activity. It was found that increases in motivation, while not affecting the overall pattern of the cardiac response, lead to increases in the amplitude of the response.

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THE RELATIONSHIP BETWEEN EXTRAVERSION AND TOUGH-MINDEDNESS IN A "TOUGH-MINDED" CULTURE*

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Two of the most influential theories of personality, those of the Authoritarian Personality (1) and Eysenck (4), posit a close functional relationship between social attitudes and deeper personality trends. The former argues that ethnic prejudice is a reflection of authoritarian personality trends while the latter maintains that the tender-toughmindedness dimension is an expression in the attitudinal field of introversion-extraversion. According to Eysenck (4) the easily conditionable introvert is more thoroughly socialized than the extravert (because of his greater conditionability) and hence acquires the ideas of restraint and control, which define the tender-mindedness pole (and lie at the heart of the socialization process), to a greater extent than the latter.

It has been argued by Orpen (6) and confirmed in two studies (7, 8) that the relationship between prejudice and personality is largely a function of whether the prevailing norms explicitly sanction "prejudiced" ideas. It is contended that if they do then individuals will be encouraged to hold intolerant attitudes irrespective of their basic personality structure.

The present study was designed to test whether this above argument is specific to the prejudice-authoritarian relationship or whether it would hold for other attitude-personality relationships as well: e.g., tough-mindedness and extraversion.

In order, therefore, to extend the generality of the view that attitudes are not closely related to deep-lying personality trends when the attitudes are culturally sanctioned, 90 Afrikaans-speaking school children in their final year of school (average age 17.2) from urban middle-class homes were given (*a*) a specially-developed Afrikaans version of the Eysenck Personality Inventory (EPI) developed by Eysenck and Eysenck (5) to measure extraversion (E) and neuroticism (N), as well as (*b*) Eysenck's Tender-mindedness scale (T), consisting of the 10 T_1 items in Eysenck (3), and (*c*) the Bogardus social distance scale (SD) to assess attitudes toward minority groups in South Africa (Jews, Coloreds, Indians, and Africans). It is important to note that tough-minded attitudes form a central feature of the ideology of the Afrikaans-speaking community, who are in effective control of South Africa (2, 10, 11).

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The correlation between extraversion and "culturally disapproved" tender-minded views, as assessed by the T-scale, was virtually zero ($r = .08$, $p > .05$). This result supports the main argument of the present study regarding the lack of relationship between attitudes that meet strong societal approval *or* disapproval and deeper personality trends, but fails to confirm Eysenck's main hypothesis concerning a negative relationship between extraversion and tender-mindedness. However the social distance scale was significantly related to tender-mindedness in the expected inverse direction ($r = -.56$, $p < .01$).

The orthogonal relationship posited by Eysenck between extraversion and neuroticism was borne out, with an insignificant correlation being found between the E and N scales of the EPI ($r = -.19$, $p > .05$). The mean E and N scale scores of the present sample did not differ significantly ($p > .05$) from those of the normative sample. However the present sample obtained a significantly lower ($p < .01$) mean score on the T-scale than the samples of American students studied by Siegman (9); i.e., they were significantly more tough-minded than the latter. They were also very prejudiced in terms of their mean score on the SD-scale, with 67% wishing "to exclude Africans from my country."

Finally, the correlation between extraversion and prejudice, as measured by the SD-scale, was insignificant ($r = .17$, $p > .05$), while that between neuroticism and prejudice was significant at the .05 level ($r = .23$).

Since the Afrikaans sample of the present study were significantly less tender-minded than comparable groups brought up elsewhere, but did not differ as regards the personality dimension of extraversion (or neuroticism), and since little of the variation in tender-mindedness can be ascribed to extraversion (or neuroticism) it seems that the holding of attitudes on the tender-tough-minded dimension is due to accommodation to cultural norms rather than to the possession of specific personality trends.

At a more general level the results suggest that the relationship between extraversion and tough-mindedness varies with the cultural background of the group concerned; i.e., that Eysenck's theory is culturebound. In fact, with the use of Eysenck's premises, it is possible to argue for a positive relationship between introversion and tough-mindedness. If a culture emphasizes "tough-minded" views then the introverted individual who, according to Eysenck, conditions very easily and is therefore over-socialized relative to the extravert, should be more *not* less tough-minded than the latter.

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HUMAN PERFORMANCE IN A THREE-AXIS TRACKING PROBLEM USING TWO DISTINCT HAND CONTROLLER CONFIGURATIONS*[1]

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RUEL E. JONES[2] AND DARHL M. PEDERSEN

A. INTRODUCTION

As man has ventured into new and hostile environments, his role in controlling the attitude and translation of his vehicle has become increasingly more critical. The hand controller provides the interface between the operator and the vehicle, and it has been demonstrated that its configuration affects the efficiency of that interface. Chernikoff, Duey, and Taylor (2) have indicated that uniform control dynamics in all three axes help to optimize efficiency. Jenkins and Karr (4) have established a two and a half to one system gain (ratio of movement of hand controller tip to corresponding movement of display) as best. Haaland (3) has established a 20 degree forward rake as the most comfortable in some spacecraft applications.

It was the purpose of this study to demonstrate which of two distinct hand controller configurations provides the most efficient interface in a three-axis compensatory tracking problem. The two configurations used were (*a*) a single three-axis hand controller, and (*b*) a dual stick configuration in which the right-hand controller commanded pitch and roll axes while the single-axis left-hand controller commanded the yaw axis.

B. METHOD

1. *Subjects*

Thirty-two male, advanced Air Force ROTC cadet volunteers served as *S*s for this experiment. The *S*s were equally divided between the junior and senior classes, and their ages ranged from 20 through 27, with a mean age of approximately 24.

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2. *Apparatus*

The apparatus was designed to simulate a manual three-axis vehicle attitude stabilization problem. The simulated three-axis artificial horizon utilized had the capability of displaying simultaneous or serial displacements up to 15 degrees in the pitch, roll, and/or yaw axes. Figure 1 shows the display in a straight, level, and on-heading condition. A slight nose down, bank right, and left of heading condition is shown in Figure 2. The displayed excursions from the straight, level, and on-heading condition could be eliminated by proper manipulation of the hand controller(s).

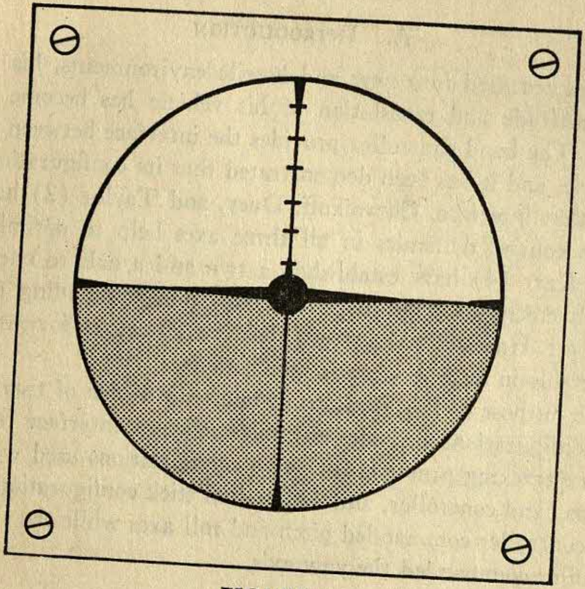

FIGURE 1
A Straight, Level, On-Heading Display

Figure 3 is a functional block diagram of the apparatus. During normal operation the artificial horizon displacement signals originated in the error generator. This electro-mechanical device consisted of three cam driven potentiometers and a variable speed cam drive motor. Each potentiometer supplied the error signal for one attitude axis. The magnitude and direction of the error signal was controlled by the cam shape, and the rate was controlled by the cam shape and its rotational speed. By switching or rotating the cams in respect to one another an infinite number of error sequences could be programmed. During normal operation the error generator sent its signals to the

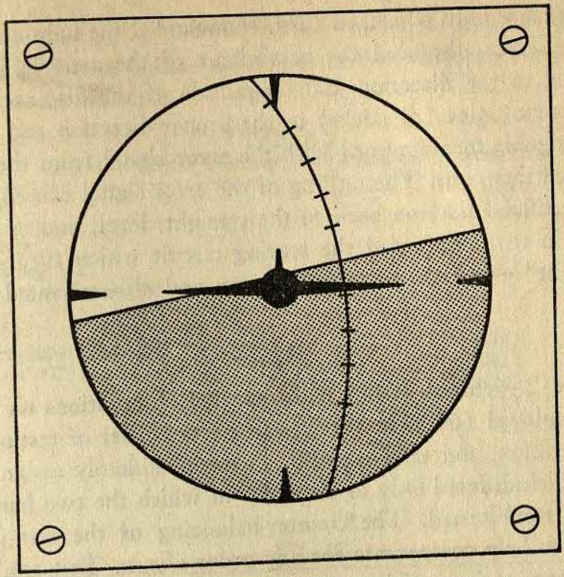

FIGURE 2
A Right Roll, Nose Down, Left of Heading Display

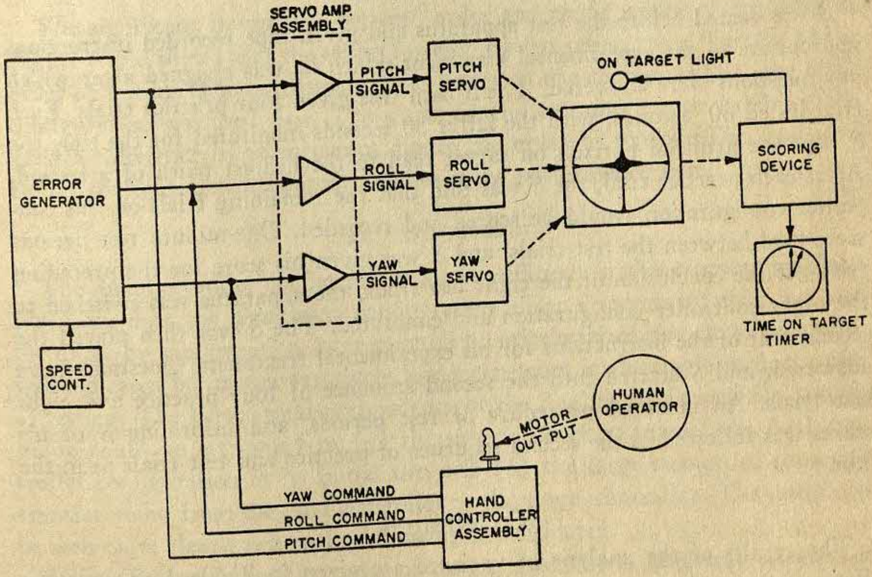

FIGURE 3
Functional Block Diagram

servo amplifier assembly which, in turn, commanded the appropriate servos to displace. The servos displaced the hemisphere of the artificial horizon. The subject reacted to the direction and magnitude of the displacements by displacing the control stick (or sticks) in the proper direction and amount. The control stick signals then summed with the error signal from the error generator and nulled them out. The nulling of the error signal caused the servos to position the artificial horizon back to the straight, level, and on-heading condition. This, in turn, activated the scoring circuit which turned on a green "on target light" above the artificial horizon and also activated an electrical timer.

3. *Design*

A 2 × 2 × 2 factorial design with repeated observations on the last two factors was employed (6). The three factors were order of testing, hand controller configuration, and trial segment. *S*s were randomly assigned to one of two groups which differed only in the order in which the two hand controller configurations were tested. The counter-balancing of the test presentations was employed to help compensate for any order effects. Test trials were split into two segments of four trials each so that learning could be monitored.

4. *Procedure*

S was seated before the test apparatus and given tape recorded instructions appropriate to the experimental treatment which he was assigned after which any questions were answered. The *S* then was given four practice trials. Each trial lasted 60 seconds, with the latter 50 seconds monitored for the time the *S* kept the artificial horizon on target read to the nearest tenth of a second. After each practice trial, the *S* was told that the remaining trials on this controller configuration would be scored and recorded. One-minute rest periods were used between the test trials, and *S* was given his score for the preceding trial. At the conclusion of the eight test trials, the apparatus was switched to the other controller configuration and calibrated. The *S* was then played the second half of the instructions for his experimental treatment. Questions were answered, and *S* started into the second sequence of four practice and eight test trials. An identical procedure of rest periods, and informing *S* of his scores was followed in the second sequence of practice and test trials as in the first.

C. RESULTS

The results of the analysis of variance are given in Table 1. Two main effects and one interaction effect reached significance. Performance on the dual controller configuration was significantly better than on the single controller configuration, and the latter four test trials were significantly higher than the first four test trials.

TABLE 1

Analysis of Variance of Time on Target

Source	*df*	*MS*	*F*
Between subjects			
Order of testing (A)	1	2096	.255
Subjects within groups (D)	30	9317	–
Within subjects	96		
Controller configuration (B)	1	3145	4.285*
Trial segment (C)	1	10612	19.821**
A × B	1	23233	31.657**
B × D	30	733	
A × C	1	668	1.248
C × D	30	535	
B × C	1	590	1.709
A × B × C	1	745	2.158
B × C × D	30	346	
Total	127		

* $p < .05$ level.
** $p < .01$ level.

The significant interaction between order and configuration is displayed in Figure 4 and shows that the scores for each configuration are a function of the order of testing. The performance was better on one configuration if the other configuration was used first. The single controller configuration exhibited the greater difference in performance due to the order of testing. The dual controller configuration exhibited a higher mean performance score.

D. Discussion

The dual controller configuration is more efficient in this tracking problem. Not only does the significant configuration effect demonstrate this, but also the order by configuration interaction. The inferiority of the single controller was indicated by its comparatively low mean score in the single to dual order of testing. The better total performance of the dual to single order of testing group could be attributed to (*a*) the superior performance of the dual controller configuration in its initial use, and (*b*) the large amount of proactive transfer going from the dual controller to the single controller. The latter can be seen more clearly when the following is considered.

If it is assumed that the order of testing groups was randomly selected, it would follow that the groups would have had comparable dual controller

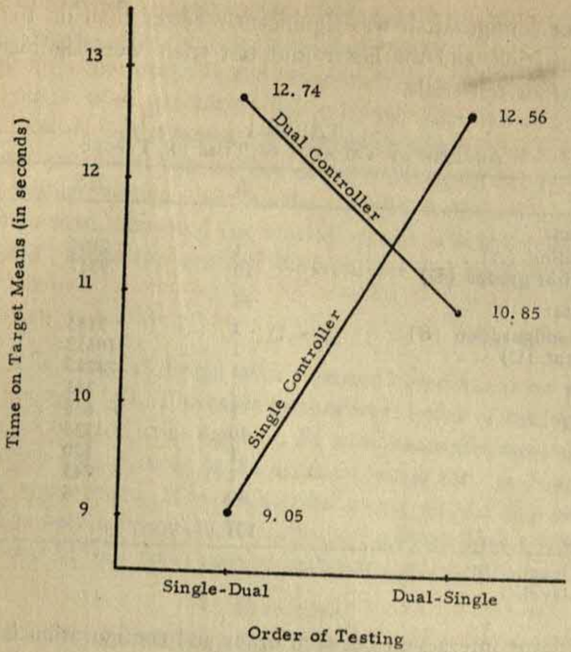

FIGURE 4
Time on Target for Subjects in Two Different Orders of Testing Using Two Distinct Hand Controller Configurations

performance if they both had been tested on that configuration first. The small difference from the base level of performance established by the group that did use the dual controller first and the level established by the group using the dual controller second could be attributed, in part, to the proactive transfer from using the single controller configuration first. The large difference in single controller performance between the group using it first and the group that used it second could be attributed to (*a*) the comparative difficulty in using the single configuration first, and (*b*) the large amount of proactive transfer from using the dual controller first. This is consistent with Barch and Lewis (1), who noted more proactive transfer when going from an easy to a more difficult tracking task.

The significant task segment effect seemed to indicate that most of the *S*s were still learning the task, since the mean performance score on the latter four trials was significantly higher than the mean for the first four trial scores. Todosiev, Rose, and Summers (5), in a study of tracking error with single and dual axis problems, noted a similarly significant difference in performance in their *S*s as training progressed.

Future studies in this area should explore the persistence of the difference in the two controller configurations by allowing the *S*s to train long enough to exhibit a more stable performance over the test trials. It should also be determined if the difference in tracking performance is affected by the amount of stress introduced into the task. Though man's adaptive nature may be able to minimize or completely mask differences in efficiency of control configurations, marked differences may appear under certain conditions. If this proves to be the case, differences in efficiency between controller configurations would certainly merit much more careful study and consideration in future vehicle design.

E. SUMMARY

The effect of two different hand-controller configurations on human performance during a three-axis compensatory tracking problem was investigated. Subjects were divided into two groups and then trained and tested on identical tasks using both controller configurations. Only the order of controller configuration used first differentiated the two groups. The task required the subjects to keep a simulated three-axis artificial horizon in a straight, level, and on-heading condition while programmed error signals were introduced. The dual controller configuration was found to be easier to use.

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ADOLESCENTS' PERCEPTION OF THEMSELVES AND ADULTS IN HUTTERITE COMMUNAL SOCIETY*[1]

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A. INTRODUCTION

In previous studies of social role perception among Hutterites, Schludermann and Schludermann (4, 5, 6, 7) have suggested that the egalitarian and communal social structure of Hutterite society tended to retard the development of social perception—especially the differentiation of social roles. In this study another aspect of Hutterite social perception was studied: How do adolescents compare themselves to adults of their own society? Several unique characteristics of Hutterite society make this aspect of social perception especially interesting for social scientists. Hutterite socialization practices (e. g., communal child rearing) differ considerably from the socialization patterns of other societies living in North America (e. g., 3). Hutterite society is characterized by an age-sex grading; that is, the oldest male adults have the greatest prestige and most power in any colony. In any colony the number of young adolescents is quite small. In a typical colony of about 200 inhibitants there are approximately 7 to 12 adolescents in the age range from 13 to 15 years. The Hutterite adolescent of this age level has little if any contact with non-Hutterite adolescents. Even the contacts with adolescents from other colonies are limited and take place on special occasions (e. g., marriages) under well supervised colony conditions. On the other hand, Hutterite adolescent boys and girls have many interactions with adults of their own sex group. Especially during the busy summer months adolescent boys and girls are assigned as helpers and apprentices to same sex adults (not necessarily parents). They spend much time with adult "masters." Because of these features of Hutterite society the vertical (adult to teenager) flow of influence is dominant over the horizontal (adolescent to adolescent) flow of influence. Therefore peer-acceptance is much less of a potent pressure on colony adolescents than is

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adult approval. In his description of Hutterite socialization practices Peters (3) pointed out that Hutterite adolescents expressed more concern about what adults thought of them than about what their peer group thought of them.

In any society the status of adolescents tends to be defined relative to the adult status of that society: Adolescents tend to describe themselves by the degree to which their position, characteristics, or privileges differ from those of adults. Moreover, the adolescent's perception of adult expectations and adult behavior forms an important factor mediating the socialization of adolescents (e. g., 1). The purpose of this study was to investigate the relationship between Hutterite adolescents and adults by ascertaining the characteristics of adolescents' perceptions of themselves and of adults. It was assumed that such an investigation would reveal the personal and interpersonal attributes which are of high concern to Hutterite adults in the socialization of their adolescents.

B. METHOD

1. *Subjects*

One hundred and sixty-three (98 girls, 65 boys) *S*s, 13 to 15 years of age, from 20 Hutterite colonies participated in the study. All of these colonies were located in rural Manitoba.

2. *Research Instrument*

Hess and Goldblatt (2) developed a research instrument whereby teenagers and adults could describe the characteristics and expectations of themselves and of the adult group. The research instrument is essentially a set of 20 rating scales which are used to describe four concepts: (*a*) the "average teenager," (*b*) the "average adult," (*c*) "teenagers from the viewpoint of an adult," and (*d*) "adults from the viewpoint of an adult." The concepts were selected by Hess and Goldblatt so as to obtain the following types of adolescent perceptions of self and others: (*a*) the actual evaluation of the own status group —i. e., "self-rating," (*b*) the evaluation of the other status group (adults), in terms of "actual reputations," (*c*) the prediction as to how the other status group would rate ons's own status group in terms of "expected reputations," (*d*) the prediction as to how the other status group would rate its own members in terms of "predicted self-ratings."

The 20 rating scales describing the four concepts were selected from interviews assessing parent-teenager interaction. They were based on comments made by teenagers and adults in these interviews. Hess and Goldblatt selected as scales those character-traits which were frequently mentioned when adults and adolescents were compared. They therefore represent the most salient criteria whereby adults and adolescents evaluate themselves and each other.

In the research instrument the position (right *vs.* left side of page) of the socially desirable and undesirable ends of the rating scales was randomized. The following scales were used: 1. neat-untidy, 2. patient-impatient, 3. cooperative-uncooperative, 4. serious-frivolous, 5. responsible-irresponsible, 6. courteous-rude, 7. mature-immature, 8. cautious-impulsive, 9. consistent-inconsistent, 10. grateful-ungrateful, 11. reliable-unreliable, 12. stable-unstable, 13. moral-immoral, 14. self-directed-easily influenced, 15. respectful-disrespectful, 16. unspoiled-spoiled, 17. considerate-inconsiderate, 18. self-controlled-wild, 19. thoughtful-thoughtless, 20. loving-angry. The rating scales were divided into 5 segments with 3 as the neutral point. For each scale the socially undesirable end was scored 1, while the desirable end was scored 5.

When analyzing the results from such a research instrument which consists of socially desirable variables the researchers must consider the defensiveness among subjects. The problem of defensiveness seems to be especially serious with Hutterites, because in previous studies Schludermann and Schludermann (4, 5, 6, 7) have found Hutterites reluctant to use unfavorable terms when describing other Hutterites. As a result of this defensiveness the average rating of any concept tends to be on the favorable side of the neutral point. In spite of this response bias, quantitative comparisons are still possible but comparisons must be made in terms of the relative degree of desirability: e. g., highly favorable, somewhat favorable, and very little favorable. Differences between concepts in the degree of favorableness are more revealing than the "absolute" rating of a given concept on the favorable-unfavorable continuum.

3. *Investigative Procedure*

Hutterite adolescents completed the rating scales in small groups. The instructions and procedure of administration and the method of scoring were basically the same as that used by Hess and Goldblatt (2).

C. RESULTS

1. *Data Analysis*

The scores associated with each of the four concepts were analyzed separately for boys and girls. For each of these eight sets of scores means, and standard deviations of the 20 rating scales were calculated (see Table 1). The boys' and girls' ratings of a given concept (e. g., "average adult") were compared

TABLE 1

HUTTERITE ADOLESCENT RATINGS OF CONCEPTS[a]

	Concept One					Concept Two				
	Girls		Boys			Girls		Boys		
Scales[b]	Mean	S.D.	Mean	S.D.	*t*	Mean	S.D.	Mean	S.D.	*t*
1	4.39	1.03	4.09	.91		4.79	.54	4.28	1.02	3.71***
2	3.66	1.39	3.52	1.39		4.47	.89	4.00	1.19	2.71**
3	4.21	1.12	4.05	1.20		4.41	3.96	4.14	1.14	
4	3.33	1.48	3.42	1.35		1.14	1.38	3.55	1.46	
5	4.17	1.06	3.82	1.38		4.44	1.11	4.20	1.15	
6	4.03	1.14	3.74	1.18		4.60	.78	4.05	1.21	3.28**
7	3.84	1.25	3.69	1.29		4.38	1.07	4.15	1.10	
8	3.64	1.40	3.54	1.34		4.26	1.12	3.77	1.33	2.43*
9	2.53	1.43	3.22	1.41		4.12	1.25	3.55	1.37	2.69**
10	4.51	.89	4.08	1.09	2.67**	4.69	.68	4.26	1.06	2.93**
11	4.23	1.06	3.88	1.16		4.41	1.03	4.17	1.16	
12	3.98	1.15	3.49	1.25		4.10	1.18	3.72	1.26	
13	4.01	1.24	3.62	1.20		4.26	1.08	3.98	1.23	
14	3.41	1.46	3.35	1.41		3.81	1.47	3.54	1.46	
15	4.43	.94	4.02	1.12	2.46**	4.76	.67	4.34	.95	3.07**
16	3.81	1.49	3.52	1.36		4.31	1.25	4.12	1.06	
17	3.84	1.29	2.63	1.18		4.23	1.12	3.97	1.20	
18	4.01	1.29	3.49	1.53	2.25*	4.48	.89	4.23	1.11	
19	4.33	1.05	3.74	1.29	3.06**	4.77	.65	4.31	1.05	3.13**
20	4.47	.84	4.11	1.12	3.22*	4.74	.66	4.40	.86	2.75**

by subjecting each scale to a *t*-test for independent group means (see Table 1). Thereafter, the differences between any two concepts within each sex group were examined by subjecting each of the 20 scales to a *t*-test for correlated means (see Table 2). In each of the between-concept comparisons, the mean values of the second mentioned concept were subtracted from the mean value of the first mentioned concept. Therefore, positive *t*-values indicate that the first mean is larger; conversely, negative *t*-values indicate that the second mean is larger.

When interpreting these two tables it should be noted that with 20 comparisons, chance factors could easily account for one comparison where the means were different at the .05 level of significance. Therefore, in describing the results of Tables 1 and 2 the investigators emphasized those comparisons where the *t*-tests were significant at the .01 level or where several *t*-tests were significant at the .05 level.

2. *Comparisons of Boys and Girls*

a. Concept 1: "Average Teenager." On most scales the ratings of boys and girls were very similar. There were, however, some interesting exceptions: Compared with boys, girls rated the average teenager as being more grateful, TABLE 1 (*continued*)

	Concept Three					Concept Four				
	Girls		Boys			Girls		Boys		
Scales[b]	Mean	S.D.	Mean	S.D.	t	Mean	S.D.	Mean	S.D.	t
1	4.03	1.28	3.74	1.30		4.80	.49	4.38	.85	3.51***
2	3.73	1.47	3.11	1.48	2.66**	4.46	1.01	3.98	1.31	2.48*
3	3.93	1.37	3.58	1.41		4.35	1.17	4.09	1.08	
4	3.20	1.51	3.40	1.30		3.92	1.42	3.72	1.30	
5	3.86	1.36	3.57	1.23		4.37	1.20	4.11	1.12	
6	3.98	1.22	3.26	1.46	3.28**	4.46	1.05	4.26	1.01	
7	3.78	1.35	3.23	1.33	2.54*	4.21	1.20	4.15	1.04	
8	3.58	1.40	3.48	1.30		4.33	1.06	3.82	1.32	2.61**
9	3.55	1.47	3.37	1.37		4.05	1.27	3.74	1.32	
10	4.16	1.11	3.62	1.34	2.73**	4.68	.76	4.37	1.02	2.13*
11	3.96	1.35	3.69	1.31		4.45	1.02	3.95	1.22	2.70**
12	3.71	1.39	3.48	1.37		4.17	1.17	3.78	1.26	1.99*
13	3.83	1.27	3.63	1.27		4.20	1.04	3.98	1.25	
14	3.17	1.57	3.20	1.46		3.71	1.55	3.55	1.50	
15	3.92	1.41	3.65	1.36		4.50	.99	4.26	1.00	
16	3.43	1.60	3.58	1.40		4.33	1.21	3.95	1.31	
17	3.65	1.36	3.55	1.24		4.22	1.17	3.94	1.23	
18	3.60	1.50	3.60	1.45		4.52	.84	4.26	1.15	
19	3.99	1.34	3.57	1.41		4.71	.71	4.31	1.12	2.59**
20	4.13	1.14	3.62	1.36	2.54*	4.70	.63	4.23	1.02	3.35***

[a] Concept One—Average Teenager, Concept Two—Average Adult, Concept Three—Teen Viewed by Adult, Concept Four—Adult Viewed by Adult.

[b] *Scales*: 1. neat-untidy, 2. patient-impatient, 3. cooperative-uncooperative, 4. serious-frivolous, 5. responsible-irresponsible, 6. courteous-rude, 7. mature-immature, 8. cautious-impulsive, 9. consistent-inconsistent, 10. grateful-ungrateful, 11. reliable-unreliable, 12. stable-unstable, 13. moral-immoral, 14. self-reliant-easily influenced, 15. respectful-disrespectful, 16. unspoiled-spoiled, 17. considerate-inconsiderate, 18. self-controlled-wild, 19. thoughtful-thoughtless, 20. loving-angry.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

respectful, and thoughtful ($p < .001$), as well as being more self-controlled and loving ($p < .05$).

b. Concept 2: "Average Adult." The ratings of girls tended to be much more favorable than that of boys. Girls described the average adult as being more neat ($p < .001$), patient, courteous, consistent, grateful, respectful, thoughtful, and loving (all these $p < .01$), as well as more cautious ($p < .05$).

c. Concept 3: "Teenager from the Viewpoint of Adults." The ratings of boys and girls were highly similar with a few interesting exceptions. Girls described the adults' perceptions of teenagers more favorably on the following scales; patient, courteous, grateful (all $p < .01$), as well as mature and loving ($p < .05$).

d. Concept 4: "Adults from the Viewpoint of Adults." For most scales the ratings of boys and girls were highly similar. There were however a few

TABLE 2

WITHIN GROUP CONCEPT COMPARISONS (t-VALUES) OF HUTTERITE ADOLESCENTS

Scales[b]	Concepts[a] Rated by Girls 1 vs. 2	1 vs. 3	1 vs. 4	2 vs. 3	2 vs. 4	3 vs. 4
1	—3.63***	2.78**	—3.63***	6.08***		—5.60***
2	—6.26***		—5.44***	5.21***		—4.42***
3		1.97*		3.32***		—2.60**
4	—3.77***		—3.51***	4.57***		—4.31***
5	—2.51*	2.16*		3.64***		—2.97**
6	—4.87***		—3.11**	4.51***		—3.11**
7	—3.76***		—2.30*	4.10***		—2.92**
8	—3.67***		—4.30***	4.13***		—5.46***
9	—3.86***		—3.20**	3.63***		—3.53***
10		2.87**		4.27***		—3.95***
11				3.48***		—3.12**
12				2.64***		—3.09**
13				3.80***		—2.80**
14	—2.76**			3.98***		—3.10**
15	—3.27**	3.43***		5.67***	2.42*	—3.48***
16	—3.23**	2.39*	—3.20**	5.25***		—4.77***
17	—2.52*		—2.48*	3.86***		—3.57***
18	—3.57***	2.89**	—3.32**	5.57***		—5.79***
19	—3.40***	2.75**	—3.15**	5.92***		—4.95***
20	—2.65**	3.24**	—2.38*	5.59***		—4.84***

exceptions: Compared with boys, girls described the adults' perception of other adults as being more favorable on the following scales: neat and loving ($p < .001$) cautious, reliable, and thoughtful ($p < .01$), as well as patient, grateful, and stable ($p < .05$).

The comparisons of Hutterite boys and girls suggested the following pattern: On all scales where there were statistically significant differences the self-ratings and the "predicted ratings" of the girls were more favorable than those of the boys. Boys and girls tended to agree closely with respect to the self-rating (Concept 1) and expected reputation (Concept 3) of their own age group. They tended to disagree to a much greater extent as to the other rating (Concept 2) and expected reputation (Concept 4) of adults.

3. *Comparison of Concepts*

Examination of Table 2 suggested that the over-all trend in the relative rating of concepts was similar for boys and girls; that is, the same set of concepts consistently were more favorably rated than other concepts by both boys and girls. Despite this agreement, the girls tended to perceive greater differences between concepts more often than did the boys. This trend was reflected in the greater t-values (and thereby a larger number of scales with significant differences) in case of girls.

TABLE 2 (*continued*)

	Concepts[a] Rated by Boys					
Scales[b]	1 vs. 2	1 vs. 3	1 vs. 4	2 vs. 3	2 vs. 4	3 vs. 4
1		2.01*	—2.11*	2.94*		—4.14***
2	—2.31*	2.01*	—2.24*	4.32***		—4.31***
3		2.52*		2.47*		—2.71**
4						
5				3.45***		—2.86**
6		2.66**	—2.85**	3.90***		—5.20***
7	—2.53*	2.52*	—2.74**	4.83***		—4.92***
8						
9			—2.55*			
10		3.13**		3.51***		—3.92***
11				2.55*		
12						
13	—2.16*		—2.26*			
14						
15		2.44*		3.45***		—3.29**
16	—3.01**			2.90**		—2.01*
17	—1.99*			2.82**		
18	—3.09**		—3.33**	3.13**		—2.94**
19	—3.02**		—2.68**	3.57***		—4.30***
20		2.87**		4.68***		—3.69***

[a] Concept One—Average Teenager, Concept Two—Average Adult, Concept Three—Teen Viewed by Adult, Concept Four—Adult Viewed by Adult.

[b] *Scales*: 1. neat-untidy, 2. patient-impatient, 3. cooperative-uncooperative, 4. serious-frivolous, 5. responsible-irresponsible, 6. courteous-rude, 7. mature-immature, 8. cautious-impulsive, 9. consistent-inconsistent, 10. grateful-ungrateful, 11. reliable-unreliable, 12. stable-unstable, 13. moral-immoral, 14. self-reliant-easily influenced, 15. respectful-disrespectful, 16. unspoiled-spoiled, 17. considerate-inconsiderate, 18. self-controlled-wild, 19. thoughtful-thoughtless, 20. loving-angry.

* $p < .05$.
** $p < .01$.
*** $p < .001$.

Both boys and girls described the "average adult" (Concept 2) in more favorable terms than the "average teenager." In the case of girls this trend was much more pronounced than in the case of boys. Girls described adults as being more neat, patient, serious, courteous, mature, cautious, consistent, self-controlled, and thoughtful ($p < .001$) and to a lesser extent as being more self-reliant, respectful, unspoiled, and loving ($p < .01$). Boys described adults as being more unspoiled, self-controlled, and thoughtful ($p < .01$) and to a lesser extent as being more patient, mature, moral, and considerate ($p < .05$).

Boys and girls also agreed that adults would describe adults (Concept 4) more favorably than teenagers (Concept 3). In the case of girls all difference were statistically significant. According to boys adults would perceive adult more favorably than teenagers on the following scales: neat, patient, cour teous, grateful, thoughtful, and loving ($p < .001$) and to a lesser extent cooperative, responsible, respectful, and self-controlled ($p < .01$). On the whole, both boys and girls tended to see a greater discrepancy between Concepts 3 and 4 (teenagers and adults described by adults) than between Concepts 1 and 2 (teenagers and adults described by teenagers).

Both boys and girls described adults (Concept 2) in the same way as they expected adults to describe other adults (Concept 4). In other words the Hutterite adolescents tended to accept the opinions of adults about their own age group. In the case of girls only one scale showed a difference which was marginally significant ($p < .05$). In the case of boys no difference was statistically significant.

Comparison of Concepts 1 and 3 suggested that both boys and girls tended to describe their own age group (Concept 1) more favorably than they thought adults would describe teenagers (Concept 3). In other words, while teenagers tended to accept the adults' view of adults they did not accept the adults' view of teenagers. According to girls, teenagers were more respectful ($p < .001$) and to a lesser extent more neat, grateful, self-controlled, thoughtful, and loving ($p < .01$) than adults gave them credit for. According to boys, teenagers were more courteous, grateful, and loving ($p < .01$) and to a lesser extent more neat, patient, cooperative, mature, and respectful ($p < .05$) than their expected reputation among adults.

D. Discussion

Compared with boys, Hutterite girls tended to rate teenagers (Concept 1) and adults (Concept 2) more favorably and also attributed more favorable opinions to adults (Concept 3 and 4) than did the boys. Girls also tended to perceive greater differences in the characteristics of teenagers and adults (Concepts 1 *vs.* 2), and greater differences between their own perception of teenagers and the reputation of teenagers among adults (Concepts 1 *vs.* 3) than the boys did. This sex difference may be related to the greater amount of conformity to adult values which is expected of Hutterite girls (3). In Hutterite society adolescent girls are expected to play the role of adult women at an earlier age then boys are expected to play the roles of adult men. One would therefore expect that Hutterite girls would identify more readily with adults and would accept the adult viewpoint to a greater extent. Moreover, Hutterites tend to be reluctant to say anything bad about other Hutterites. If girls conform more readily than boys to Hutterite values, one would expect that girls would describe others more favorably and also would attribute more favorable opinions to adults.

The comparison of concepts provides information on adolescents' perceptions which may mediate their interaction with adults. Both boys and girls described adults (Concept 2) more favorably than they did describe their own age group (Concept 1). Moreover, they accepted the adults' view of other adults, as can be seen by the high similarity between Concepts 2 and 4. Moreover, both boys and girls expected that adults would describe adults (Concept 4) much more favorably than they would describe teenagers (Concept 3). As was mentioned before, girls tended to show these above-mentioned trends more clearly than did boys. Girls, much more than boys, seemed to recognize the superiority of adult status over teenage status by describing adults more favorably. Compared with boys, girls showed keener awareness of the superiority of adult status over teenage status by predicting more clearly that the adults' perception of other adults would be much more favorable than the adults' perception of teenagers. These trends are meaningful in terms of the strict age-sex grading system characteristic of Hutterite society (3) and in terms of greater amount of socialization to which Hutterite girls are subjected.

The results suggest another trend which is of special relevance to the adolescent-adult interaction in Hutterite society. While Hutterite adolescents tended to accept the adults' description of adults as accurate (Concepts 2 *vs.* 4), they did not accept the adults' opinions about teenagers: Both boys and girls described the "average teenager" much more favorably than they described "teenagers from the viewpoint of adults." Even more than boys, Hutterite girls tended to perceive keenly the unfavorable image they thought adults held of teenagers. Whether Hutterite adults do in fact have such a relatively low image of teenagers remains to be established by future empirical research.

E. SUMMARY

A group of 163 Hutterite adolescent boys and girls, 13 to 15 years of age, were asked to describe on a rating scale the following concepts: (*a*) "average teenager," (*b*) "average adult," (*c*) "teenagers from the viewpoint of an adult," (*d*) "adults from the viewpoint of an adult." Girls tended to rate all four concepts more favorably than boys. The adolescents of both sexes rated adults more favorably than teenagers and accepted the adults' description of adults. However, they rated teenagers more favorably than the expected reputation of teenagers among adults.

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BIASING FACTORS AFFECTING ESTIMATES OF FERTILITY RATES OF SCHIZOPHRENICS*[1]

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A. INTRODUCTION

Some have expressed concern about the future gene pool because marriage and fertility rates of schizophrenics have increased to levels near those of the general population (12). While an excellent series of studies by Erlenmeyer-Kimling and her coworkers successfully documents this increase (6, 10, 11, 12), the present paper presents data which suggest that even these studies substantially *underestimate* the actual marriage and reproductive rates of schizophrenics; that the true reproductive contribution of schizophrenics is probably not less than but, at least for female schizophrenics, more than their part of the population.

Analysis of the sampling methods of the Erlenmeyer-Kimling studies uncovered a number of variables, listed below, that are frequently overlooked by traditional methods of estimating marriage and fertility rates of schizophrenics. It just so happens that failure to control these variables works consistently in each case in the direction of underestimating schizophrenic reproduction.

B. SOCIOECONOMIC LEVEL

One of the most widely accepted observations about schizophrenics is that they come largely from the lower classes (7, 8, 14). Because reproductive rates are related to socioeconomic levels, in that lower levels are characterized by larger than average families (15), it is very important that the socioeconomic levels of samples of schizophrenics used in estimating reproductive rates are typical of schizophrenics in general. There are some indications that the Erlenmeyer-Kimling samples come from higher average socioeconomic backgrounds than those of the whole schizophrenic population.

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TABLE 1
MARRIAGE AND FERTILITY RATES OF SCHIZOPHRENICS FROM NEW YORK STATE AND CLEVELAND

Description of sample	1954-56 New York[a] Men	1954-56 New York[a] Women	1957 Cleveland Men	1957 Cleveland Women	Gen'l Pop[a] Women
Total Number	278	281	172	172	—
% Ever Married	37.8	64.7	53.5	75.0	76.3
% Childless of Married	26.7	19.2	17.4	17.8	18.1
Total Children	187	343	170	253	—
Children per Married Person	1.8	1.9	1.8	2.0	2.0
Children per Person	.7	1.2	1.0	1.5	1.5
Children per Reproductive Person	2.3	2.3	2.2	2.4	2.5

[a] From Goldfarb and Erlenmeyer-Kimling (12).

For example, marriage and fertility rates (see Table 1) were higher for a Cleveland sample than for Erlenmeyer-Kimling's New York sample when both were matched on several variables, but not socioeconomic level. For the Cleveland female schizophrenics, these rates were very much like those of the normal control population. The New York sample of 559 white schizophrenics was admitted between 1954 and 1956, for first or later admissions, to randomly selected state hospitals in the state of New York. The Cleveland sample included all white schizophrenics ($N = 344$) admitted during 1957 to a large state receiving hospital that served the entire city of Cleveland at that time. This sample was the same as the New York sample in age range (males, ages 15 through 49 years, females, 15 through 44 years), race, and in counting only legitimate children.[2] Unfortunately socioeconomic level was not measured, but a recent sample from the same hospital indicates that the present schizophrenics from Cleveland were generally from the lower social classes (1). It is likely, then, as other factors were matched, that some of the difference found between the two schizophrenic samples (lower marriage and reproduction rates for the New York group) can be accounted for by differences in socioeconomic level.

Lending weight to this conclusion are socioeconomic ratings of the New York sample (see Table 2) which, although Erlenmeyer-Kimling does not believe them to be very reliable,[3] at least suggest that this sample comes from

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[2] Thanks are due to Ira Friedman, Ph.D., Director, Laboratory of Psychosocial Research, Cleveland Psychiatric Institute, for providing the raw data for this sample.

[3] Personal communication, December 5, 1969.

TABLE 2

SOCIOECONOMIC LEVEL OF NEW YORK SCHIZOPHRENICS COMPARED WITH NORMAL AND SCHIZOPHRENIC CONTROLS

N.Y. schizophrenics and controls	Percentages			
	I & II	III	IV	V
Socioeconomic Level				
New York schizophrenics[a]	5.5	25.3	46.7	18.9
New Haven schizophrenics	8.3	14.2	41.1	36.4
New Haven normal	11.7	20.8	50.1	17.4

[a] 3½% unknown.

higher average social backgrounds than are typical of schizophrenics. The New York schizophrenics were significantly higher in class level than New Haven white schizophrenics ($\chi^2 = 10.3$, $p = .02$); and were not significantly different from the normal white New Haven sample (14). A further indication that the New York sample represented higher than average schizophrenic backgrounds is that the offspring of these schizophrenics had lower mortality rates during infancy and childhood than did the national population (7).

Perhaps the method used in obtaining the Erlenmeyer-Kimling sample of schizophrenics, drawing a random sample of hospitals (three urban and seven from upstate New York) rather than of individuals (6), may have drawn a sample from somewhat higher socioeconomic levels. More probably, schizophrenics from the state of New York are from higher socioeconomic backgrounds than schizophrenics nationally, as residents of New York State are generally above national averages. The median income of the area covered by the 10 mental hospitals selected was over $6000 in 1967 (2). If the same studies had been conducted in a state with lower than average economic standing, would not schizophrenic reproduction have been found to be higher than in the Erlenmeyer-Kimling results?

C. RACE

It is not clear why Erlenmeyer-Kimling excluded nonwhite schizophrenics, for this procedure also serves to underestimate the total reproductive contribution of schizophrenics. Such restriction not only further limits lower socioeconomic class representation with its known higher fertility, but also excludes those among the lower classes who have the highest fertility rates (15). If black schizophrenics, like black normals, have higher fertility rates than their white counterparts, the black contribution to schizophrenic reproduction is greater than their number indicates. In Cleveland, where Negro schizophrenics made up 29.5% of the sample, they produced 35.5% of the children.[4]

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[4] All nonwhites in the Cleveland sample were Negro.

Moreover, Negro representation in schizophrenic samples is important because the proportion of Negroes in mental hospitals nationally, approximately 20% (15), is much greater than in the general population. While nonwhites in New York State represented 6½% of the population in 1950 and 9% in 1960 (13), the nonwhite schizophrenics excluded from the Erlenmeyer-Kimling sample from 1954-1950 amounted to as much as 14% of the total group.[5]

As expected, then, the sample of Cleveland Negro schizophrenics produced more children per person and per married person than the samples of white schizophrenics from Cleveland and from New York, as can be seen by comparing Table 3 to Table 1. More surprising, they also had more children per person and per married person than the general U.S. population, despite the considerably higher percentage of childless marriages among Negro schizophrenic women. In any attempt to estimate the contribution of schizophrenics to the total gene pool, elimination of nonwhites does not seem inconsequential.

TABLE 3
MARRIAGE AND FERTILITY RATES OF CLEVELAND NEGRO SCHIZOPHRENICS
(Ages 15-49 for Men, 15-44 for Women)

Description of sample	Negro Schiz.	
	Men	Women
Total Number	70	74
% Ever-Married	52.9	78.4
% Childless of Married	8.1	27.6
Total Children	109	121
Children per Married Person	2.9	2.1
Children per Person	1.6	1.6
Children per Reproducing Person	3.2	2.9

D. INSTITUTIONALIZATION

Goldfarb and Erlenmeyer-Kimling (9) report that one reason for the recent increase in reproductive rates of schizophrenics is that new drugs allow them to leave institutions earlier and remain outside institutions for longer periods of time. Recognition that institutional patterns may directly affect marriage and fertility has an important bearing on the interpretation of published estimates of schizophrenic reproduction. Persons confined in all types of institutions are known to have lower marriage and fertility rates than the outside population (15), so that it is not surprising that studies of institutionalized schizophrenics, like other studies of prisons, medical hospitals, and mental hospitals, have found marriage and fertility rates to be below national averages. The importance of considering the influence of institutionalization on marriage and reproduction rates is underlined by estimates that nearly half of all schizophrenics are probably never diagnosed or treated (18), and of those diagnosed, a sizeable proportion remain ambulant rather than hospitalized (22, 23).

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[5] Personal communication, December 5, 1969.

Can some of the reported differences in reproduction between hospitalized schizophrenics and the general population be attributed directly to the effects of confinement? One study found no differences in the amount of reproduction for women who were former inmates of mental hospitals and other women (3). Or are lower rates found because institutionalized schizophrenics are select schizophrenics? Married persons are less likely to be admitted to mental hospitals than single, divorced, or widowed individuals (15, 25). A main reason that schizophrenics are readmitted to hospitals is that they are lonely living in the community (21). Institutionalized schizophrenics are more seriously disordered than those who are not hospitalized, and significantly more of them are single or previously married. It has also been suggested that single persons are more likely to go to state and federal hospitals in which more research is done (25).

While it was not possible to compare samples of hospitalized and never-hospitalized Cleveland schizophrenics, marriage and fertility rates of hospitalized and never-hospitalized Cleveland TB patients were obtained to demonstrate that similar differences in reproductive patterns may well characterize schizophrenics. TB patients make especially good comparisons to schizophrenics because both disorders often involve relatively long periods of confinement frequently during the marriageable years, both carry some social stigma which may affect marriageability, and both are more commonly found in the lower classes.

The TB sample,[6] similar to the Cleveland schizophrenic sample, included all TB patients from Cleveland seen at two public hospitals during a single year, 1960. They were found to be predominantly from the lower socioeconomic levels (24). As shown in Table 4, never-hospitalized TB patients have higher fertility rates, higher marriage rates, and lower divorce rates than hospitalized TB patients. Interestingly, the marriage and divorce rates of hospitalized female schizophrenics and hospitalized TB patients are very similar, while both groups differ greatly from the never-hospitalized TB group.

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[6] Thanks are due to Marie Haug, Ph.D., Assistant Professor of Sociology, Case Western Reserve University, for providing the raw data for the TB samples.

TABLE 4
MARRIAGE AND FERTILITY RATES OF HOSPITALIZED AND NEVER-HOSPITALIZED TB PATIENTS

Description of sample	Cleveland TB 1960		Cleveland Schiz. 1957	
	Never-Hosp.	Hosp.	Men	Women
Total Number	79	305	242	246
% Never-Married	11.4	19.3	46.7	23.2
% Married	77.2	46.2	38.0	52.8
% Divorced, Separated	6.3	25.2	14.5	22.8
% Widowed	5.1	9.2	.8	1.2
Total Children	94	334	282	374
Children per Ever-Married	2.4	1.9	2.2	2.0
Children per Person	1.2	1.1	1.2	1.5

The male schizophrenic group, however, has by far the largest proportion of single individuals. The fertility rates of all groups of schizophrenics compare favorably with those of the TB patients.

It is only an inference, of course, that never-hospitalized and hospitalized schizophrenics would show the same kind of differences in marriage and reproduction found between comparable TB patients. Nevertheless, the evidence from TB patients adds to other indications already cited that institutionalization may significantly influence the marriage and fertility rates of schizophrenics or may act as a screen for select samples of schizophrenics. Low reproductive rates for hospitalized schizophrenics are often assumed to be the result of disturbed sexual or social development, while similar low rates for other institutionalized persons are understood as appropriate situational adjustments.

In conclusion, then, all studies, including the present one, that base marriage and fertility rates on hospitalized schizophrenics only are probably seriously underestimating the true reproductive contribution of the total schizophrenic population. It has been noted previously that studies err in claiming "that treated cases are a valid measure of what epidemiologists want to know about the mentally ill as a whole" (23, p. 351). The Dohrenwends, too, emphasize that good research requires the inclusion of untreated as well as treated cases (8).

E. TIME OF ASSESSMENT

Obtaining marriage and fertility data at the time of hospital admission is another procedure that may contribute toward underestimating schizophrenic reproduction because such data are crisis-related. It is possible that the resulting rates would be higher, even for the same subjects, if assessments were made at different times in their lives. For example, suppose for a single sample of subjects, those hospitalized before age 30 were assessed at age 45, and those hospitalized after age 45 were assessed at age 30. Many of those hospitalized at a young age may have delayed marriage and family until after discharges, while many of those hospitalized later may have finished or almost finished their families by age 30. The resulting marriage and reproductive rates for the same total group of subjects would be higher than those obtained at time of admission.

Thus, it would be somewhat better to compare marriage and fertility rates of schizophrenics with normals at age 45 only, no matter at what age the schizophrenic crisis leading to admission occurred. From the data presented in Table 5, it can be seen that the marriage and fertility rates of older hospitalized schizophrenics compare much more favorably with normal than do those of younger-aged schizophrenics. But even these comparisons are not fair because such samples of older schizophrenics exclude persons whose final hospital discharges occurred in earlier years.

TABLE 5

MARRIAGE AND FERTILITY RATES OF HOSPITALIZED SCHIZOPHRENICS ACCORDING TO AGE

	Schizophrenics				Normal
	New York		Cleveland		Cleveland[a]
Age groups	Men	Women	Men	Women	Women
% Ever-Married					
15-24	9.1	24.5	13.0	29.2	38.1
24-34	44.6	65.8	49.2	75.0	89.8
35-44	48.6	82.1	70.1	88.7	92.7
Children per Person					
15-24	.1	.2	.2	.4	1.0
25-34	.8	1.2	.8	1.3	2.2
35-44	.8	1.7	1.4	2.0	2.3

[a] From U.S. Census (26).

Erlenmeyer-Kimling (9) has recently conducted a follow-up study in which she reports only a slight increase in marriage and fertility, but the time span between admission and follow-up was only three years, still crisis-related. Younger schizophrenics may show greater increase in marriage and reproduction after a long period of time has passed. While far from ideal, a type of follow-up study was conducted in Cleveland which measured the reproductive rates, but not the marriage rates, of a group of ever-married schizophrenics without regard to date of admission.

The sample was composed of ever-married Cleveland schizophrenics, born after 1918 and hospitalized at any time after age 18 at one large state hospital in Cleveland. [They had also all attended the Cleveland public schools as children, as they were originally obtained for different research purposes (17).] In 1966, a search was made for the names and birthdates of their children from records at the Cleveland schools and at the Cleveland Social Service Clearing House. The median age of the female schizophrenics at first hospitalization was 29.5 years, with a range of 18-43 years; for the male schizophrenics, the median age at first admission was 26.5 years, with a range of 16-37 years. In 1966, the same females had a median age of 37.1, with a range of 26-47 years; and the males had a median age of 34.8, with a range of 25-48 years. The follow-up ranged from one to 23 years after first hospitalization, with a median of seven years. Subsequent hospitalizations and the number of subjects still hospitalized in 1966 were unknown.

Differing from the subjects of Erlenmeyer-Kimling, these schizophrenic individuals showed a large increase in fertility rate between admission and follow-up, as shown in Table 6. Although the Cleveland statistics were compared with first rather than mixed admission data, it is believed the differences in results go beyond this distinction to one of general method and time of assessment. On the other hand, if fertility rates at first admissions are higher or lower than those for later admissions, with age controlled, a topic that has not been investigated, it would be important for future studies to have the

TABLE 6
REPRODUCTIVE RATES OF SCHIZOPHRENICS ON FIRST ADMISSION AND ON FOLLOW-UPS

Description of sample	At First Hosp.		Follow-up (1966)	
	Men	Women	Men	Women
N (Ever-Married)	58	115	58	115
M age	26.0	29.9	34.9	38.2
% Childless	34.5	10.4	12.1	6.1
N Children	97	255	169	315
Children per Married	1.7	2.2	2.9	2.7

proportion of first-admission cases accurately represented. Turner and his colleagues (25), who studied the marriage rates of white male schizophrenics on first admission, found the proportion of married and once married individuals to be much higher than that of males in the present study and that of Erlenmeyer-Kimling. The marriage rates of their male subjects were somewhat above the same rates for female schizophrenics in the Cleveland sample.

Although schizophrenics may produce most of their children before admission (12), the number of children born after admission, at least first admission, is not negligible, according to the present results. It can be hypothesized that marriage rates would follow a similar pattern. Reproductive rates that include larger time spans after hospital admission are less sensitive to the influence of crisis and indicate that assessments taken at the time of admission or even shortly afterward are unduly low. It would seem that data gathered cross-sectionally without regard to time of admission would increase estimates of schizophrenic reproduction.

F. MARITAL STATUS

Among the ever-married in the normal population, divorced women are known to have the lowest fertility rates, while women living with their first husbands have the highest (15). Because so large a proportion of schizophrenics, at least hospitalized schizophrenics, are separated or divorced, studies which compare reproductive rates of ever-married schizophrenics and normals favor obtaining results that are low for schizophrenics.

As shown in Table 7, the proportion of schizophrenic marriages that end

TABLE 7
DIVORCE RATES OF SCHIZOPHRENICS AND NORMALS

Description of sample	Cleveland Schiz.		New York Schiz.[a]		U.S. Normal[b]
	Men	Women	Men	Women	Women
% of Total					
Ever-Married	52.3	76.8	40.8	64.3	76.0
Still-Married	38.0	52.8	31.0	44.3	69.2
Divorced, Separated	14.5	22.8	9.8	20.0	5.6
Widowed	.8	1.2	—	—	1.1
% of Ever-Married					
Still-Married	57.6	54.6	69.0	76.0	91.1
Divorced, Separated	40.2	43.1	31.0	24.0	7.4
Widowed	2.2	2.3	—	—	1.5

[a] From Erlenmeyer-Kimling, Rainer, and Kallman (10).
[b] From U.S. Census 1960 (26) white females age 15-44, in Kiser *et al.* (15).

in divorce compared to national norms so overshadows the smaller differences between the proportion of schizophrenics, especially of female schizophrenics, and normals that ever marry, as to make divorce itself an important part of the explanation for any differences found between schizophrenic and normal reproduction. Such high divorce rates among schizophrenics would strongly influence all fertility rates whether measured by children per ever-married person, children per person, or children per reproductive person, the commonly used methods.

Rates based on children per still-married schizophrenics, as presented in Table 8, are higher than those for ever-married normals (see Table 1). For female schizophrenics, the proportion of childless marriages of those still-married is below that of ever-married normals (see Table 8) and much lower than for ever-married schizophrenics. It is now known how many of the Cleveland schizophrenics had more than one marriage, a factor that is also related to fertility rates (15), but 14% of the women (though only 8% of the men) of the ever-married New York schizophrenics had more than one marriage (10) compared to 9.3% of ever-married white women in the normal population (15).

TABLE 8

FERTILITY RATES OF STILL-MARRIED AND EVER-MARRIED SCHIZOPHRENICS
(Negro and White, Ages 15-49 Men, 15-44 Women)

Description of sample	Schizophrenics			
	Ever-Married		Still Married	
	Men	Women	Men	Women
N	129	187	79	131
N Children	279	374	222	301
Children per Person	2.2	2.0	2.8	2.3

The high proportion of childless persons among divorced and separated schizophrenics also suggests that the duration of marriage before divorce is shorter for schizophrenics than normals, another factor that is relevant to reproductive rates (15). Erlenmeyer-Kimling expects to consider the influence of duration of marriage in a future analysis of her reports (12). The national median number of years before divorce is approximately 7.3 years, with an average of 1.44 children (20). Divorced and separated Cleveland female schizophrenics averaged 1.30 children; males, 1.14 children. Perhaps, then, the length of marriage before divorce, which could not be obtained for the present sample, can also partially account for differences in reproductive rates.

If, then, reported reproductive rates of schizophrenics are lower than normal largely because divorce rates are high, and duration of marriage before divorce is short, more is said about schizophrenic marriage patterns than about reproduction. Schizophrenic fertility rates would be understood in terms of social-psychological factors which cause such persons to enter into short-termed and poor marriages. It would appear, at least, that the number of divorced and separated subjects, the number of remarriages, and the length of marriage before divorce are relevant to future assessments and interpretations of the reproduction patterns of schizophrenics.

G. ILLEGITIMACY

The studies of Erlenmeyer-Kimling counted only those children produced by legally married parents, although she considers using a more inclusive definition of reproduction in future studies (9). In order to follow her procedures as closely as possible for purposes of comparison, the Cleveland sample excluded 14 children of 12 single schizophrenics but included the children of six schizophrenics with common law marriage, which is legal in Ohio.

Because no real search for children born out of wedlock was made, the 14 children found born to single schizophrenics, which was 2.1% of the children in the Cleveland survey, surely represents an underestimation of the true rates of illegitimacy among schizophrenics. Nationally, 7.74% of all births are to unwed parents (15), and there is reason to believe the percentage among children of schizophrenics would exceed the national average. The percentages of births to unmarried mothers declines with educational attainment (19), and the "overwhelming majority" of them are born to women who never get married (15, p. 133).

Although the exclusion of illegitimate births may represent a relatively minor bias in procedure, again it is one that probably works in the direction of underestimating schizophrenic reproduction, especially as lower class single persons are highly representative of schizophrenic samples. Also, there is a "far higher rate of illegitimate births to nonwhite women" (4, p. 356) who, as we have seen earlier, represent a larger proportion of the schizophrenic than of the normal population. While accurate data on children born out-of-wedlock are generally difficult to obtain, the task probably would be somewhat easier with schizophrenic subjects than with others, and in future studies this procedure would eliminate one source of underestimating schizophrenic fertility rates, in which out-of-wedlock births, for the foregoing reasons, would probably be found to be unduly large.

H. CHRONICITY AND ACUTENESS

If fertility rates of chronic and acute schizophrenics differ, it is important that each form of the disorder be proportionately represented in studies of schizophrenic marriage and reproduction. Sampling of admission, whether first or mixed, as represented in the Erlenmeyer-Kimling studies tends to result in a disproportionately large number of schizophrenics who enter, sometimes frequently, for short periods of time. Sampling of resident hospital populations tends to result in a disproportionately large number of long-term schizophrenics.

As we were not able to find studies in the literature dealing with differential fertility rates of chronic and acute schizophrenics, we report the results from an admittedly small sample, which only suggest, that differences in reproduction do occur between chronic and acute schizophrenics and that these differences may have contributed one more bias in the direction of underestimating schizophrenic reproduction.

The subjects obtained from a previous study (16), were limited to those schizophrenics for whom process-reactive ratings could be made from hospital records and who had had at least one child. Strangely, the results presented in Table 9 suggest that, of ever-married schizophrenics who have children, chronic schizophrenics have considerably higher reproductive rates than acute schizophrenics. Both groups, because of the different sampling methods employed, happen to have higher rates than either of the previous samples used throughout this paper. However, it is the relative difference between chronic and acute schizophrenics that is of interest here, and that, if found valid on replication, suggests that the development types of schizophrenics that make up samples may influence the findings on fertility. It must be noted, however, that reactive (acute) schizophrenics are more likely to marry (5) so that on the basis of children per person measurements of fertility rather than children per reproducing person, the higher rates of chronic over acute schizophrenics

TABLE 9
FERTILITY RATES OF PROCESS AND REACTIVE SCHIZOPHRENICS

Description of sample	Process		Reactive	
	Men	Women	Men	Women
N	17	26	13	31
N Children	54	88	37	90
Children per Reproductive	3.2	3.4	2.8	2.9

reported here may balance out. Also, the average hospital stay is twice as long for single persons as for married persons (25). Nevertheless, an awareness of the relative contribution of chronic and acute schizophrenics to the different measures of fertility should be helpful in evaluating future statistics and in assuring that sampling methods do not select an overabundance of either group.

I. SUMMARY AND CONCLUSIONS

The analyses presented have hopefully served two purposes: to point out certain errors in methodology in past studies that have resulted in serious underestimations of the marriage and fertility rates of schizophrenics; to point toward the kind of samples, sampling methods, and careful interpretations that are needed to avoid such errors in future studies. The studies of Erlenmeyer-Kimling were chosen as an example that even the most precise and excellent of past studies have not overcome the bias and difficulty in obtaining accurate estimates of schizophrenic marriage and reproduction. No pretense is made that the present studies were any more than illustrative of these flaws rather than being accurate estimates themselves.

Briefly, it was suggested that in order to arrive at more accurate estimates of schizophrenic reproduction, future studies should obtain samples that represent as closely as possible the schizophrenic population as a whole in socioeconomic and racial makeup; untreated and ambulant schizophrenics; chronic and acute schizophrenics; first and later admissions and offspring born out-of-wedlock. It was also concluded that time of assessment is relevant to the kind of results obtained. With a more accurate makeup of samples, findings could be better understood if duration of marriages, and number of divorces, were measured and compared to normal controls. It might also be suggested that research into use of birth control, fetal and neonatal death, and abortion would also add to a fuller understanding of schizophrenic reproduction.

It is the conclusion of this paper that if all these factors were considered in obtaining estimates of schizophrenic marriage and reproduction, the resulting estimates of these rates would be much higher than previously indicated. Indeed, evidence was presented that some of these biasing factors are so influential that were they controlled the reproductive rates of schizophrenics, at least female schizophrenics, would be found to be significantly higher than national averages, as all of them worked in the direction of underestimating schizophrenic reproduction.

The implications of this may contradict many readers' casual observations, especially those working in state hospitals who see a large number of unmarried schizophrenics on the wards. For them, it would be well to remember some of the more controlled observations of others reported earlier: single schizophrenics have more probability of being detected and diagnosed, more chance of being hospitalized, more likely to be hospitalized for a longer period of time, and more likely to return to the hospital after one hospitalization than married schizophrenics.

More exact assessments of schizophrenic reproduction in the future are desirable because of the many implications that follow them. For example, one conclusion of Erlenmeyer-Kimling (10, p. 260) is that high schizophrenic reproduction "might lead to population changes of a less desirable nature." Yet her fear that measures to improve the behavior of schizophrenics and "revitalize his social role" may threaten society because of a resulting increased contribution to the gene pool (10, p. 260) may turn out to have opposite consequences in that such socially improved parents may well have less disturbed children.

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THE USE OF TECHNICAL AND NONTECHNICAL LANGUAGE IN COMMUNICATION*[1]

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A. INTRODUCTION

The experiments reported in this paper were designed to investigate the use of technical and nontechnical language in communication. In particular, the effect of such language variation upon the evaluation and persuasibility of the communication was of primary interest.

There appears to be no available evidence from the literature on the evaluative influence of technical *vs.* nontechnical language. King (7) employed communications varying in technical language for the purpose of conferring varying statuses on the communicators. Although he did not test for evaluation, he found no differences in the recall of information presented under the different conditions.

Despite the lack of experimental or theoretical interest in the technical-nontechnical language dimension, recommendations for the use of one or the other kind of language abound. Dentists, for example, have been advised to use more technical, high-status language if they wish to be more persuasive and have people follow their advice (2).

In the following experiments, an attempt was made to specify the psychological factors underlying the effectiveness of variations in technical and nontechnical language.

B. EXPERIMENT I

On the basis of a cue from King (7), Experiment I was designed on the hypothesis that technical language produces the effect of conferring increased status upon the communicator (Hypothesis 1). Several studies have demonstrated the operation of such factors as status, prestige, and trustworthiness on persuasibility (4, 5, 6). These factors all serve to lend credibility to the source, and greater source credibility yields greater persuasibility.

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Two independent variables were employed in Experiment I: language technicalness and communicator status. On the basis of Hypothesis 1 and previous work on the effects of communicator status, it was expected that both variables would yield main effects. Technical language was predicted to be more effective than nontechnical language, and high-status communicators more effective than low-status communicators.

Moreover, Hypothesis I implies further that the predicted language technicalness effect should be more pronounced for initially low-status communicators (students) than for high-status communicators (dentists).[3] On this basis an interaction between communicator status and language technicalness was predicted. On the other hand, the absence of such an interaction would be consistent with the assumption that language technicalness operates independently of status.

1. *Method*

a. Subjects. Forty-eight high school seniors were sampled randomly and were arbitrarily divided into four groups of 12 each.

b. Design. These four groups were assigned to the cells of a 2 × 2 factorial design. The Language treatments were technical and nontechnical language. The Status treatments were a high school senior (low status) and a respected dentist (high status).

The dependent variable consisted of *S*s' combined evaluations of the speaker and the speech, obtained from 11 items administered following the communication. The decision was made to group the speaker and speech evaluation scores, as they did not differ over the treatment combinations. The correlation between the two scores was .67. A 12th item was included to measure the perceived difficulty of the speech.

c. Material. The speeches, prepared as reading material in two forms, contained information about dental health. The first form contained nontechnical language (e.g., 1. checking and cleaning the teeth, 2. tooth decay, 3. crack, 4. X-ray picture, 5. crooked teeth, 6. gums), and the second form contained technical language with occasional definitions (e.g., 1. dental prophylaxis—examining and cleaning the teeth, 2. dental caries, 3. fissure, 4. radiograph, 5. malocclusion, 6. gingivae).

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[3] This expectation is based upon the (reasonable) assumption of a monotonically ncreasing, but negatively accelerated relationship between communication evaluation nd status.

By attaching the appropriate introduction sheet to the speech, the communicator for one-half of the speeches was portrayed as being a respected dentist and for the other half as being a high school senior interested in dentistry.

The evaluation instrument consisted of a six-point, Likert-type scale composed of 12 items, 11 of which were designed to determine *S*s' evaluation of the speaker and the speech (e.g., "I have little confidence in the speaker"; "The speech was quite convincing"). One item was included to determine *S*s' evaluation of the difficulty of the speech (e.g., "The talk was difficult to understand"). The majority of the items in the evaluation instrument were from McCroskey (8).[4]

Seven multiple-choice comprehension questions were included with the evaluation instrument as an internal check on the *S*s to insure that the speech was read.

d. Procedure. Subjects were all seated in the same room and were instructed to read one of several speeches which allegedly had previously been given orally by the communicator. The material was distributed randomly. They were allowed six minutes' reading time, and eight minutes for evaluation and response to the questions.

After all the material was collected, *S*s were provided a brief description of the purpose of the study.

2. *Results and Discussion*

Response to the comprehension questions indicated that *S*s had indeed digested the communications. In addition, difficulty scores (scaled from zero to 5) revealed the technical communication, 1.75, as more difficult than the nontechnical communication, 1.00 ($t_{df=46} = 1.98, p < .05$).

Table 1 summarizes the means and standard deviations of communication evaluations for the high- and low-status communicators using technical and nontechnical language. The interaction effect between the variables was not reliable ($F_{1,44} = .015$). However, the main effects for both the Language treatments and the Status treatments were both significant ($F_{1,44} = 11.05$, $p < .01$, and $F_{1,44} = 4.33$, $p < .05$, respectively).

As predicted, communications were evaluated more highly when they contained technical (as opposed to nontechnical) language, and when the communicator was a dentist (as opposed to a student). The lack of an interaction effect in the face of both main effects does not support Hypothesis 1, and is interpreted as consistent with an assumption of independence between Status and Language variations.

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[4] Both sets of speeches and the evaluation instrument are available from the authors upon request.

TABLE 1
EXPERIMENT I. MEANS AND STANDARD DEVIATIONS OF EVALUATIONS USING TECHNICAL LANGUAGE WITH DEFINITIONS AND NONTECHNICAL LANGUAGE IN COMMUNICATIONS PRESENTED BY HIGH-STATUS (DENTIST) AND LOW-STATUS (STUDENT) COMMUNICATORS

	Communicator					
	Dentist		Student			
Language	*M*	*SD*	*M*	*SD*	*M*	*SD*
Technical	42.75	4.06	38.16	4.03	40.45	4.7
Nontechnical	35.25	10.04	30.08	10.42	32.66	10.9
	39.00	8.5	34.12	8.9		

C. EXPERIMENT II

Experiment II was designed to determine whether a "complexity" dimension can be supposed to underlie the technical-nontechnical language variable. In addition, in order to explore the limits of the Language effect, Experiment II provided for an additional, more extreme "technical" condition, wherein the technical language was left wholly undefined in the communication.

The test of the complexity hypothesis (Hypothesis 2) employed the following reasoning. Research in motivation indicates that the relation between stimulus complexity and affect can be described by an inverted-U function [summarized by Berlyne (1)]. The more complex an event, the more positive its evaluation—up to a point. Beyond this point, increases in complexity produce decrements in positive affect. If complexity underlies language technicalness, it would be expected that under conditions of very high communication complexity, technical language would be less effective in a communication than would nontechnical language.

This expectation amounts to the prediction of an interaction effect between language technicalness and communication complexity, where communication complexity is manipulated independently of technicalness. This independent manipulation was achieved in Experiment II by varying the amount of information in each of the technical and nontechnical communications.

Thus, it is predicted (*a*) that while at low levels of information, technical language will produce a more favorable effect than nontechnical language (as in Experiment I), the reverse effect will occur under conditions of high amounts of information; (*b*) in addition, if complexity (assumed independent of status) underlies both amount of information and language technicality, then communicator status is predicted not to interact with either variable; and (*c*) finally, the status effect is expected to be replicated.

1. *Method*

a. Subjects. A random sample of 72 high school seniors was divided into six groups of 12.

b. Design. A 3 × 2 × 2 factorial design with repeated measures was employed, where the repeated measure was Information. The Language treatments were nontechnical, technical-with-definitions, and technical language. The Information treatments were a low-information and a high-information communication. The Status treatments were, as before, low status (a high school student) and high status (a respected dentist).

The dependent variables, as in Experiment I, were *S*s' combined evaluation of the speaker and the speech recorded from 11 items, and evaluation of the difficulty of the speech by a single item.

c. Material. The speeches were prepared as reading material in six forms. There were three forms containing low information (i.e., the dental health speeches of Experiment I) and three forms containing high information. The high-information material consisted of discussion of the development, structure, and function of the teeth.

The language treatment in the low-information speeches was essentially the same as in Experiment I. An example of the progression of language technicalness in the high-information speeches is as follows: "form" in the nontechnical treatment, to "morphology—the form" in the technical-with-definition treatment, to "morphology" in the technical treatment.

The preparation and introduction of materials was otherwise identical to that in Experiment I.

d. Procedure. Subjects were all seated in the same room in 12 rows of six each. Each student was instructed to read two speeches, which allegedly had previously been given orally by the communicator. Both speeches were in the same treatment combination for each *S* (Language and communicator Status) differing only in the amount of information from low in one speech to high information in the other. The order of reading was low-high information for one-half the students and high-low information for the other half. Distribution of treatment forms was conducted by rows.

2. *Results*

Mean evaluations and standard deviations for all treatment combinations are given in Table 2.

The only interaction effect to achieve significance was the Language × Information interaction ($F_{2,66} = 16.11$, $p < .01$). The other interaction terms

TABLE 2
EXPERIMENT II. MEANS AND STANDARD DEVIATIONS OF EVALUATIONS USING TECHNICAL, TECHNICAL WITH DEFINITIONS, AND NONTECHNICAL LANGUAGE CONTAINING LOW AND HIGH INFORMATION PRESENTED BY HIGH-STATUS (DENTIST) AND LOW-STATUS (STUDENT) COMMUNICATORS

		Information			
		Low		High	
Language	Communicator	*M*	*SD*	*M*	*SD*
Technical	Dentist	43.58	5.60	*37.75*	5.61
	Student	39.42	4.68	*36.67*	5.59
Technical/Def.	Dentist	42.50	2.02	41.08	4.92
	Student	40.58	6.69	40.00	5.58
Nontechnical	Dentist	*36.33*	5.59	41.33	3.86
	Student	*31.67*	9.29	37.58	7.63

(Language × Information × Status, Language × Status, and Information × Status) did not reach significance (respectively, $F_{2,66} = .26$, $F_{2,66} = .39$, and $F_{1,66} = 1.28$).

The reliable Language and Status main effects of Experiment I were replicated ($F_{2,66} = 4.02$, $p < .05$, and $F_{1,66} = 4.92$, $p < .05$, respectively). The Information main effect was not significant ($F_{1,66} = .11$).

To provide a more detailed analysis of the Language × Information effect, consider the six Language × Information treatment blocks in Table 2. In particular, consider the nontechnical-low information and the technical-high information cells italicized in the lower left and upper right portions of Table 2. Each set of italicized means is reliably smaller than the adjacent set of means in its corresponding row and column. These four differences are all reliable, with t's ($df = 22$) ranging from 2.07 to 3.82 (all p's $< .05$).

The mean difficulty scores for the six Language × Information treatments revealed reliable differences, ranging from .67 for the nontechnical-low information condition to 3.21 for the technical-high information condition, ($F_{2,69} = 15.43$, $p < .01$).

All three predictions of Hypothesis 2 were confirmed. The Status variable, while showing a main effect (Prediction 3), was independent of both the Language and Information factors (Prediction 2). Finally, the Language × Information interaction was primarily due to the comparatively low evaluations in the nontechnical-low information and the technical-high information conditions (Prediction 1).

The assumptions regarding language technicalness which constitute Hypothesis 2 are as follows: (*a*) a theoretical dimension, "complexity," underlies the language technicalness dimension and bears a direct relationship to it;

(*b*) on the basis of independent work [by Berlyne (1) and others—see Fiske and Maddi (3)], complexity, construed generally as the amount of information in the stimulus, is assumed to display an inverted-U relationship when projected against affect; and (*c*) affect is assumed to underlie and bear a direct relationship to the dependent variable of the present experiments: i.e., evaluation. Coordinate with these assumptions, Experiment II demonstrated that while the conditions of lowest and highest communication complexity produced the lowest evaluations, the other four conditions, being of an intermediate degree of complexity, yielded higher overall evaluations.

In conclusion, the efficacy of technical language in communication appears to depend on the complexity of the ideas to be communicated, but not on the status of the communicator. While the communication of simple, familiar ideas is accomplished more effectively by technical language, clear and simple language is more effective for communicating difficult ideas. The universality of these generalizations beyond the kind of communication and kind of population employed here remains to be explored.

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(c) on the basis of [illegible] their relationship to the dependent variable of the present [illegible] consistent with these assumptions, Experiment II is designed [illegible] while the conditions [illegible]

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THE EFFECT OF CULTURAL FACTORS ON THE RELATIONSHIP BETWEEN PREJUDICE AND PERSONALITY*

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A. INTRODUCTION

The most fashionable theories of prejudice—frustration-aggression (6), psychoanalytic (11) and authoritarianism (1)—are those which maintain, in some form or another, that prejudice is mainly an expression of deep-lying personality trends; that an individual holds intolerant attitudes towards minority groups as a way of dealing with some inner difficulty.

This stress on the "expressive" fruition of prejudice is perhaps the result of studying prejudice within one sort of cultural setting; one in which a variety of racial attitudes are tolerated. In this setting the cultural norms do not explicitly define the appropriate attitudes; hence the individual is often given the latitude to "choose" attitudes that are congruent with his inner needs. On the other hand in a different setting, where prejudice is the approved norm, it is likely that, since the cultural norms explicitly define the appropriate views, many individuals will be "forced" to hold these prejudiced views, irrespective of their basic personality structure.

This argument can be summarized in the view (12) that the relationship between prejudice and personality is largely a function of whether the prevailing cultural norms explicitly sanction "prejudiced" ideas. In terms of this argument there should only be a fairly close relationship between prejudice and personality in relatively "democratic" settings (e.g., California), which have wide-range norms that do not closely define what the individual's attitude should be toward minority groups. The relationship should be fairly weak in relatively "authoritarian" settings (e.g., white South Africa), which have narrow-range norms that closely define the appropriate attitudes toward minority groups. A number of empirical studies support this prediction from the underlying argument insofar as they have shown that in fairly "authoritarian" settings like white South Africa, the Deep South, and the Middle

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East the relationship between prejudice and personality is not as close as in fairly "democratic" settings like Europe and the Northern United States (14, 16, 18, 20).

This lack of relationship between prejudice and personality in fairly "authoritarian" settings suggests that "expressive" theories may be culture-bound in the sense that the close functional relationship between prejudice and inner needs posited by these theories only obtains under certain sorts of cultural settings.

The few cross-cultural studies that have investigated this problem have all employed authoritarianism as the crucial personality variable. Their results strictly indicate only that authoritarianism, as measured by a version of the F-scale (1), is not highly related to ethnic prejudice. The possibility still exists, therefore, that the results may be due to "instrument factors" (5); to common elements in a set of measures that do not extend to other measures of the same (or similar) construct. In this respect there are a number of studies which have demonstrated that psychologists often discover meaningful relationships between constructs *so long as* they confine themselves to a particular set of instruments (e.g., the F-scale, the E-scale) but little or no agreement where the same constructs are measured by different instruments (2, 3, 10). There are also studies which have shown that the relationship between prejudice and authoritarianism differs from that between prejudice and other related personality variables. For instance Orpen (14) has shown that intolerant attitudes among Afrikaans-speaking South Africans are more highly related to authoritarianism than dogmatism.

B. METHOD

To eliminate the possibility that in "prejudiced" cultural settings the prejudice-personality relationship is small *only* when "personality" refers to F-scale authoritarianism, 92 English-speaking schoolchildren (average age, 16.9) from urban middle-class homes were given two measures of prejudice and two measures of deeper personality trends that are theoretically associated with authoritarianism: namely, dogmatism and worldmindedness, as well as a measure of "South Africanism."

Two important points should be noted. First, that the English-speaking sector of the white population of South Africa seems to constitute a fairly "authoritarian" cultural group in which prejudiced norms receive a large degree of normative support (13, 22). For instance, the majority of the members of this group support political parties which broadly endorse a white supremacy ideology with gradual extension of the franchise, under very restricted conditions, to nonwhites (4, 9). Second, that the measures of dogmatism and worldmindedness were conceived outside the framework of the Authoritarian Personality and differ markedly from the F-scale in construction and permitted mode of response.

The measures of prejudice were (*a*) a short form of the Bogardus social distance scale (SD) used by Pettigrew (17) with South African university students, which tapped attitudes towards minority groups in South Africa, and (*b*) a 12-item measure of anti-African prejudice (PR) developed according to the scale discrimination technique of Edwards and Kilpatrick (7) from statements made by South African students about Africans in informal discussion groups, that is relatively high as regards unidimensionality (rep = .86) and discriminating power (phi = .65). The measure of "South Africanism" (SA) consisted of 16 items reflecting typical South African values in a variety of areas like censorship, immigration, sport and entertainment. This scale was developed from an initial pool of 50 items rated by a group of 10 judges on a five-point scale in terms of the degree to which they represent traditional South African views. Only those items were retained which received mean scale values greater than 4.0 (i.e., were regarded by most judges as indicating "very typical" South African views). These 16 items were then given to two criterion groups, consisting of 50 South African-reared adults (average age, 23) who had undergone military training and 50 European-reared adults (average age, 24) who had not undergone military training; when they expressed their agreement with the item-statements on a six-point scale, the difference between their mean scores on each of the items was significant beyond the .01 level, with the South African group getting the higher score in each case.

The first measure of personality was the Smith and Rosen (21) Worldmindedness scale (W) designed to identify "the individual who favors a world-view of humanity." This scale, which consists of 32 items, 16 of which are proworldminded and 16 antiworldminded, has been shown to have a strong inverse relationship with F-scale authoritarianism. In their pilot study Smith and Rosen (22) found that the high scorers on the W-scale obtained a significantly higher ($p < .001$) mean score on the F-scale than the low scorers, which prompted them to conclude "The results indicate that the worldmindedness dimension is closely (and inversely) related to the dimension of authoritarianism and it is parsimonious to consider them as slightly different aspects of the same personality structure" (22, p. 179-180).

The second measure of personality was Rokeach's (19) Dogmatism scale (D) designed to identify "the individual who possesses a closed, rigid cognitive system." The version used was the 40-item Form E of the Dogmatism scale, which was standardized on a large sample of English university students. The Dogmatism scale has been found to be significantly related to the F-scale but to be "factorially discriminable" (8). This finding, together with the fact that the Dogmatism scale has a negligible relation with the liberal-conservative ideological dimension (unlike the F-scale) has prompted Rokeach (19) to argue that "The Dogmatism scale appears to be just about as good as a measure of authoritarianism as the F-scale" (19, p. 27).

C. RESULTS AND DISCUSSION

The subjects scores on the various scales were intercorrelated (Table 1). The correlation between South Africanism and anti-African prejudice was significant at the .01 level ($r = .42$), as was that between South Africanism and social distance attitudes ($r = .56$). This indicates that there is a close relationship between the holding of prejudiced views toward minority groups, especially Africans, and adherence to typical South African values.

TABLE 1
SCALE INTERCORRELATIONS
($N = 92$)

Scale	SA	PR	SD	W	D
SA					
PR	.42**				
SD	.56**	.20			
W	.20	.23*	.25*		
D	.18	.18	.20	.63**	

* $p < .05$.
** $p < .01$.

However, neither of the correlations between South Africanism and the personality dimensions of worldmindedness and dogmatism was significant (South Africanism and Worldmindedness, $r = .20$ $p > .05$; South Africanism and Dogmatism, $r = .18$ $p > .05$). This suggests that the extent to which an individual holds typical South African values is fairly independent of his position on the personality dimensions of worldmindedness and dogmatism. As in the case of authoritarianism the development of these personality syndromes is probably due to a combination of "inborn" temperamental traits and patterns of early upbringing rather than to a later accommodation to specific cultural norms.

The mean score of the sample on the Dogmatism scale did not differ significantly ($p > .05$) from that of the English normative student sample

TABLE 2
SCALE MEANS AND STANDARD DEVIATIONS

Scales	SA	PR	SD	W	D
Mean	59.72	50.52	4.20	117.10	160.21
SD	12.21	8.76	2.71	27.77	25.22

reported by Rokeach (19); their mean Worldminded score, while slightly higher than that of the United States student sample reported by Smith and Rosen (21) did not differ from the latter at the .05 level (Table 2).

However, the subjects obtained fairly high scores on the two prejudice measures. For instance over 65% of the subjects expressed "strong agreement" with the following item-statements in the anti-African scale; "Trying to educate the African only results in uprisings and clashes," "The Africans are several decades behind the Europeans in moral development," "Intermarriage with Africans would degrade the white race," and "The African is essentially lazy," while 63% of them said of Africans in the social distance scale that they "would prefer to have nothing to do with them," and 5% said they "wished someone would kill all of them."

If we assume that, like authoritarianism, dogmatism and worldmindedness represent the personality potential of subjects for prejudice then the above set of results can be taken as supporting Pettigrew's (16) argument that "Thus these South Africans are sharply prejudiced against blacks without possessing any greater externalizing personality potential for intolerance than people in more tolerant areas" (16, p. 34).

The correlation between the scales of prejudice and the two personality dimensions indicate that only a small proportion of the variance on the prejudice scales can be ascribed to the personality dimensions of dogmatism and worldmindedness. For instance, the correlations between anti-African prejudice and Worldmindedness ($r = .23$, $p < .05$) and Social Distance attitudes and Worldmindedness ($r = .25$, $p < .05$) suggest that only about 6% of the prejudice variance can be due to worldmindedness. Neither of the correlations between anti-African prejudice and Dogmatism ($r = .18$, $p > .05$) and Social Distance and Dogmatism ($r = .20$, $p > .05$) were significant at the .05 level, suggesting that only about 4% of the prejudice variance can be attributed to dogmatism. These findings are in line with those of Orpen (15) who reported insignificant correlations in a sample of English-speaking South Africans between the same two measures of prejudice used in the present study and authoritarianism, as measured by a forced-choice form of the F-scale.

The results of the present study support the hypothesis that prejudice is not closely related to personality in settings where "prejudice" is an approved norm. They also make clear the fact that the "expressive" theories of prejudice, which conceive of prejudice as having a close functional relationship with deeper personality trends, do not hold up well in a relatively "authoritarian" climate.

D. SUMMARY

To test whether the relatively small relationship between prejudice and personality in "prejudiced" cultural settings would only be found when "personality" referred to authoritarianism, as measured by the F-scale, 92 English-speaking schoolchildren reared in the relatively "prejudiced" climate of white South Africa were given two measures of prejudice toward minority groups, a special measure of "South Africanism" and two measures of personality, Rokeach's Dogmatism scale and Smith and Rosen's Worldminded scale. The high correlations between South Africanism and the measures of prejudice, together with the insignificant correlations between these measures and dogmatism or worldmindedness, was taken as evidence that it is accommodation to cultural norms rather than deep-lying personality trends that determines the holding of prejudiced views in a "prejudice" climate. The results are discussed in terms of the limitations of "expressive" theories to account adequately for prejudice in settings where "prejudice" is an approved norm.

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THE RELATIONSHIP BETWEEN LIKING AND PERCEIVED SELF-DISCLOSURE IN SMALL GROUPS*

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A. INTRODUCTION

Self-disclosure has been defined as the communication of one individual's private world to another person, in language which can clearly be understood by the recipient (5). The importance of the ability or willingness to self-disclose for developing and maintaining personal relationships has frequently been noted (e.g., 3, 5, 8, 10). The relationship between liking a target person and the amount of self-disclosure to that person has been studied extensively with American *S*s, and, with the exception of one study (6), a significant positive correlation has been found (2, 4, 7, 9, 11, 12).

The present study looks at the relationship between liking and self-disclosure from a different direction: to what extent is liking a person related to how much he has self-disclosed? Jourard (4) found only weak support for this relationship. More recently, in a study of recidivists, Persons and Marks (10) found a positive correlation between inmate interviewers' liking of inmate interviewees and the amount of the interviewees' self-disclosure. However, the authors did not find a similar significant correlation between liking and self-disclosure when college students interviewed inmates. If interpersonal relationships are viewed as ongoing interactions, it may be that the relationship between liking and perceived self-disclosure is mediated by the length and degree of development of the relationship. A recent study by Halverson and Shore (3) in a Peace Corps Training Program did reveal that self-reported social accessibility was related to peer nominations (sociometric inventory) after extensive interpersonal relationships had developed, but not initially when *S*s were strangers. The authors suggest that self-disclosure plays a more prominent role in interpersonal popularity as relationships move from acquaintanceship to friendship. Finally, Worthy, Gay, and Kahn (12) discovered a similar relationship between liking and perceived self-disclosure in a laboratory study with groups of four *S*s. They interpreted their results

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in terms of social exchange theory: that is, that self-disclosure is a reward or positive outcome that is appreciated and reinforced by others.

In the present study liking and perceived self-disclosure were measured in the context of an ongoing encounter group. The group was designed to foster intra- and interpersonal growth, and self-disclosure was implicitly valued as appropriate group behavior. It was hypothesized that the correlation between liking a particular group member and the amount of self-disclosing behavior of that member would be high and that it would change significantly as interpersonal relationships matured.

B. METHOD

1. *Subjects*

*S*s were 10 clinical psychology graduate students and the group leader was a faculty member in the Department of Psychology. All *S*s had some acquaintance with each other prior to the present study; the range of the length of the relationships was from four months to three and one-half years.

2. *Procedure*

The group met for three hours one evening a week for 10 weeks. Data were collected at the beginning of the first, sixth, and tenth group meetings. At each of these sessions each *S* was identified by a Roman numeral to assure that the data would remain anonymous. Each *S* was instructed to complete two rank-orderings of all the other *S*s. He was asked to: (*a*) "Rank the group members from one to 10 from the person you like best to the person you like least," and (*b*) "Rank the group members from one to 10 from the person who has self-disclosed the most in the group to the person who has self-disclosed the least." In all, each member completed a total of six rank orderings. Spearman rank-order correlations between the rankings for liking and perceived self-disclosure were computed at each of three points in time for both the individual data and the grouped data.

It is noteworthy that the most prominent measure of self-disclosure, the Jourard Self-Disclosure Questionnaire, was not utilized in this study. While the Jourard questionnaire tends to indicate the amount of factual information (e.g., work, money, personality) disclosed, the rank-order method allows the rater to use his own criteria of self-disclosure, which may differ from those of Jourard.

C. RESULTS

Significant rank order correlations ($p < .05$) between the degree of liking a member and the amount of his self-disclosure were found for 10 of the 11

TABLE 1
CORRELATIONS BETWEEN RANK-ORDERS OF LIKING AND AMOUNT OF PERCEIVED SELF-DISCLOSURE

	Liking-Self-disclosure Sessions		
Subjects	1	2	3
I	.70*	.64*	.93**
II	.78**	.33	.31
III	.82**	.71*	.77**
IV	.94**	.61*	.48
V	.49	.58*	.30
VI	.79**	.56*	.79**
VII	.72*	.67*	.43
VIII	.88**	.98**	.89**
IX	.61*	.16	—.24
X	.61*	.78**	.70*
XI	.90**	.89**	.93**
Median	.78**	.64*	.70*

Note: *Rho* = .56 for the .05 level (*) and .75 for the .01 level (**) with $N = 10$.

*S*s in Session I (see Table 1). The range of correlations was .49 to .90; the median was .78 ($p < .01$). Significantly high correlations between liking and perceived self-disclosure were found for nine of the 11 *S*s in Session II. The range of correlations was .16 to .98; the median was .64 ($p < .05$). In Session III only six of the 11 correlations between liking and perceived self-disclosure were significant at or below the .05 significance level. The range of correlations was larger than in the other two sessions (viz., — .24 to .93); the median was .70 ($p < .05$).

In order to describe group trends, the raw ordinal data were converted into interval data with the use of Thurstone's paired comparisons method (1). Table 2 lists the scale values on both variables for each *S* in the three sessions.

TABLE 2
INTERVAL SCALE VALUES FOR LIKING AND PERCEIVED SELF-DISCLOSURE

	Session I		Session II		Session III	
Subjects	Liking	Self-disclosure	Liking	Self-disclosure	Liking	Self-disclosure
I	.876	1.010	.649	.839	.322	.113
II	.478	1.017	.572	.760	.380	.332
III	.000	.534	.808	.883	.334	.643
IV	.749	.505	.981	1.375	.527	1.124
V	.611	.987	1.113	1.615	.506	1.136
VI	.133	.082	1.292	1.260	.686	.623
VII	.135	.245	.000	.000	.000	.154
VIII	.586	.869	1.396	1.825	.784	1.333
IX	.226	.409	.429	.299	.221	.000
X	.153	.338	1.096	1.615	.728	.092
XI	.036	.000	1.169	.860	.504	.536

Chi-square tests of significance for the scale values resulted in the following nonsignificant values ($df = 45$): Session I: "like," $\chi^2 = 24.92$, S-D, $\chi^2 = 23.26$; Session II: "like," $\chi^2 = 33.19$, S-D, $\chi^2 = 53.24$; Session III, "like," $\chi^2 = 17.89$, S-D, $\chi^2 = 23.50$. The scale values were therefore acceptable.

Pearson product-moment correlations were computed for each session with the use of the group data. The results for Session I revealed an $r = .764$ ($p < .005$, $df = 9$); For Session II, $r = .798$ ($p < .005$, $df = 9$); for Session III, $r = .538$ ($p < .05$, $df = 9$). With the use of the Fisher r to z transformation, these correlations were not significantly different.

D. DISCUSSION

Results from the present study support the hypothesis that liking a person is consistently and positively related to the amount of his self-disclosure. This finding is in accord with correlations reported in previous studies (3, 4, 10, 12). There is some reason to believe that as interpersonal relationships develop, a person's liking for another person becomes based on criteria other than self-disclosure, which serves a particularly prominent role in the early stages of group functioning. While there was no significant difference among the correlations between these two variables from Session I to Session III, the range of individual correlations became considerably larger at the end. That is, after 10 weeks of a shared encounter group experience, liking and perceived self-disclosure were not significantly related for approximately half of the group members. By this time liking a group member may be more strongly influenced by criteria other than self-disclosing behavior, which may no longer necessarily serve a positively reinforcing function.

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ESTIMATION AS A FUNCTION OF DENSITY AND CONTRAST*

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A. INTRODUCTION

Estimation of the number of visual stimuli has been related to (*a*) information which has been transmitted, (*b*) the nature of subjective information which was extracted, and (*c*) the nature of the organization of displays in terms of the subjective information relevant to the observer.

In visual temporal transmission, White (12) reported that perceived number is a function of the number of stimuli and the time of presentation. He concluded that central processes are involved in perceived number. Taves (9) inferred two central mechanisms: (*a*) subitizing for low informational frequency and (*b*) estimation for higher levels. Later Kaufman, Lord, Reese, and Volkmann (5) and Jensen, Reese, and Reese (4), using dots as stimuli, confirmed the existence of two mechanisms. Estimation showed greater variability than the subitizing operation.

In visual transmission, Klemmer and Frick (6) reported on assimilated informational coding as dependent on the size of the matrix: i.e., message magnitude. With low informational content in the displays, the results indicated a minimal loss as message size increased. Their coding involved informed subjects in terms of the number of dots; they found neither frequency counting nor estimation were involved.

Smith, Farquhar, and Thomas (8) employed other coding for separability of color and form as related to the density of the formatted displays for specific variables affecting counting time. Color coding, which was relevant to the item count, improved visual separability. Increasing density of the display decreased performance. Smith and Thomas (7) on nonformatted displays reported superiority of color coding to symbolic coding.

When Beckwith and Restle (1) imposed the identification of subjective content on information extraction, they found that enumeration involved the imposed organization. Estimation required grouping and stimulus organization.

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The properties of the display, or a sample of the display, were reported by Teichner (10) in terms of matrix order, redundancy, and time-rate factors. Subjective information was nonlinearly related to source information. Differences in the results between Klemmer and Frick (6) and those of Teichner were partly attributed to information processing of different displays, especially in their time-rate factors. Teichner and Sadler (11) had related the effects of exposure time and density on visual symbol identification, concluding that, for short exposure time (.05 to 2.5 seconds), increasing density yielded increased letter identification. Within limits, a dense, well-ordered pattern of stimuli was more quickly and accurately enumerated than the same number of objects scattered over a wider area.

Inherent in these approaches are several problems. Teichner pointed out that the subjects' description (encoding) of the display is one transmission problem. The complexity required the subjects to assimilate information according to code and, in terms of this review, certain variables were of interest: stimulus differentiation in context, classification, total size of the display, or parts of the display, density, and the nature of the symbols.

In another approach, the limits of processing information, as in perceived number, depended on the number of elements which, in turn, is based on the identifiability of single elements. With change in the number of elements and the differentiation among the elements, the field of estimation may expand. Interactions between, or within, specific sensory attributes may affect the attentional field and increase the perceived number within the field.

Further questions concerning central organization in some phenomena using contrast and assimilation were predicted by Bevan and Turner (2). Using random scatters of dots on a gray field, they demonstrated the effects of assimilation and contrast on number estimation. By varying frame size and by instructing subjects to identify stimuli, they were able to produce under- and overestimation of dots. Their anchor designate, the frame, served as ground to the contextual stimulus. With an increase in actual dot frequency, underestimation increased.

B. METHOD

The research which has been reviewed indicated a need for further study of certain variables which are functional in color coding with specific reference to subject sensitivity to color, density of informational content for known numbers of elements, and some instructional factors. Coding efficiency apparently was related to some density function(s).

Further research has indicated that observer sensitivity, in terms of normal perception covering visual areas generally sensitive to color and form perception, could be studied by requiring estimations of perceived number of simple dot forms. For this purpose three homogeneous backgrounds of either white, neutral gray, or black were prepared and, on each of these fixed backgrounds, dots of one of two colors, either yellow red or yellow green, were displayed. Dots were of one size and were dispersed in either a large zone or a small zone. Random dispersals of dots were prepared for each of seven frequency levels from 16 through 37. The estimated number of dots was obtained at one fixed duration of card exposure for each of the 84 display cards.

The present study reports one experiment with female observers who were selected as color normals. The revised A.O.C. Test of Hardy, Rand, and Rittler (3) is reasonably sensitive in detecting red-green color deficiencies.

One hypothesis was that color normal subjects should detect and estimate a specific number of dots at each frequency on a fixed ground for each areal density. Dots in each display were either yellow red or yellow green. No display consisted of a mixture of these secondary colors.

A second hypothesis was that the background and the stimulus-ground contrast would affect estimates: the greater the contrast, the more accurate the estimations through improved detection.

A third hypothesis was that the magnitude of the estimation would be determined by the dot frequency. Furthermore, it was expected that the area-frequency combination, representing a density factor, would influence responses in estimation of perceived number.

1. *Subjects*

Thirty female students were used following the administration of the revised A.O.C. Test for color blindness. Since only two subjects missed one plate each, the sample was classified as color normals. A critical score is four errors.

2. *Apparatus*

The Harvard tachistoscope (Gerbrands) employing 4W daylight illuminant was used to expose each card for one second. The pre- and postexposure fields were in each instance the same level of brightness as the exposure ground. Luminosity as measured by the Macbeth illuminometer was as follows: light ground 20 ftL, medium ground 10 ftL, and dark ground 1 ftL.

The three backgrounds, matched to Munsell standards by photographic process, were white (Munsell 9.0), gray (Munsell 7.0), and black (Munsell 1.5). Circular dots (.25 inch diameter) were prepared from Hering papers

#3 YR and #7 YG and were mounted in frequencies of 16, 19, 23, 26, 29, 33, or 37 dots of one color on a card. The large area (zone L) was approximately 7 inches × 7 inches; the smaller (S) was 4.5 inches × 4.5 inches. Each of the random dot arrays was replicated in all color-ground combinations. With three grounds, two colors, two areas, and seven dot frequencies, there were 84 observations on each subject.

3. *Procedure*

In the dark room subjects were screened with the A.O.C. Pseudo-Isochromatic plates. The color normal observers were then seated in front of the tachistoscope and given the following instructions: Fixate the center of the illuminated area and, on a ready signal, estimate the number of dots on each card immediately after the card has been exposed.

Subjects were informed that their only task was to estimate and that they should not attempt to count the dots.

As a block of trials, each of the cards of one ground was presented for a duration of one second. Within any one block, the cards were randomly presented for color, scatter, and frequency: each block of grounds also appeared equally often in first, second, or third serial position. Thus practice effects were controlled in this initial experiment.

C. RESULTS

For this mixed-model analysis of variance, color, ground, area, and frequency were fixed effects. A statistical summary is presented in Table 1 for the mean estimates of the number of dots perceived in the 84 displays. The results of the analysis of variance provided the following information.

As predicted, the number of dots affected the estimated number ($F_{6,2436} = 317.721$ $p < .001$). With a few exceptions, study of the mean estimates indicates that *S*s underestimated the number of dots on each card, and the magnitude of underestimation increased as the dot frequency increased.

Estimates with the larger area were significantly greater than those with the smaller area (mean L = 24.3, mean S = 23.1); dispersal of dots over retinal areas, zones, was significant ($F_{1,2436} = 19.913$ $p < .001$).

The dot color affected the estimates ($F_{1,2436} = 4.820$ $p < .05$), but estimates were not affected by ground nor by ground-color interaction (contrast). The YR dots typically elicited higher estimates than the YG dots (mean YR = 24.1, mean YG = 23.5).

Two interactions, color-number, by zone, ($F_{6,2436} = 3.126$ $p < .005$) and area-number, density, ($F_{6,2436} = 2.625$ $p < .025$) were significant. Table

TABLE 1
MEAN ESTIMATES OF THE NUMBER OF DOTS

Ground	Color	Area	Dot frequency						
			16	19	23	26	29	33	37
Black									
	YR	L	14.5	20.1	24.7	24.9	27.7	28.6	32.9
	YR	S	13.4	17.4	21.6	21.9	23.4	28.5	31.1
	YG	L	14.8	17.2	19.5	23.3	28.8	29.3	34.3
	YG	S	15.9	18.1	20.9	21.3	25.5	29.6	31.8
Gray									
	YR	L	15.2	19.5	23.7	25.2	28.0	29.5	33.3
	YR	S	14.5	17.7	22.4	25.0	25.1	28.7	32.2
	YG	L	14.7	17.5	20.9	23.3	28.0	29.0	32.8
	YG	S	15.1	17.1	21.0	22.9	24.9	28.7	30.0
White									
	YR	L	15.9	19.8	23.9	25.4	27.0	28.6	33.3
	YR	S	15.0	17.3	23.2	23.8	25.5	29.2	31.7
	YG	L	15.6	16.9	20.5	24.0	29.0	30.6	32.0
	YG	S	15.9	17.3	22.8	22.5	24.9	29.7	30.2

2 contains the mean estimates for color-number ard area-number. The standard deviations for estimated frequency, when studied for relationships to mean estimates, provided some insight into the interaction: the mean YR and mean YG plots against the actual frequencies crisscrossed three times for color, yet the mean estimates for areas L and S against actual frequencies were not crossed.

Removal of a mean-variance relationship was obtained by square root transformation and a second analysis was performed. The results of the latter analysis showed that both the significant main effects and interactions in the original analysis were also significant in the transformed analysis. The p levels remained unchanged throughout. The significant color-number interaction indicates that the effect of the color-number on estimation is not simply additive.

TABLE 2
MEAN ESTIMATE FOR COLOR AND AREA

Variable	Dot frequency						
	16	19	23	26	29	33	37
				Color			
YR	14.8	18.6	23.2	24.7	26.1	28.8	32.4
YG	15.3	17.4	20.9	22.9	26.8	29.5	31.8
				Area			
L	15.0	18.5	22.2	24.4	28.0	29.3	33.1
S	15.0	17.5	22.0	22.9	24.9	29.1	31.1

Likewise, the effect of the combination of the variables area and number cannot be obtained by simple addition of these individual effects.

D. SUMMARY AND DISCUSSION

Thirty female color normal *S*s were presented with either YR or YG circular dots, at seven frequency levels, on each of three neutral grounds. Subjects estimated the number of dots.

The effect of manipulating the frequency and areal dispersal of each of two hues on three grounds provided six conditions of contrast, seven dot frequency levels, and two levels of density in the displays. The two secondary colors, YR and YG, were within the sensitive spectral range and within normal zonal areas of color sensitivity. Although spectral photopic YG is slightly higher in brightness, the YR yielded the more accurate estimates. The color normal *S*s gave unequal detection estimates.

At all dot frequencies the larger areal dispersions yielded more accurate estimations. Yet *S*s underestimated the actual number. The more dense displays were increasingly underestimated. The zonal distributions were affected by area-number interaction, which may be interpreted as a density effect.

Teichner and Sadler had noted for short exposures a positive relationship between density and identification; for longer exposures the relationship was inverse. It is noted that in this report, a greater density did not lead to more accurate estimations. The present task of estimation is not the same as symbol identification.

For the present study, since the background reflectances determined three adaptation levels, the insignificant ground effect may be interpreted as no effect on estimates of these single-color-dot displays. As long as dots of the two colors were detected as separable from ground, the ground change did not affect the number estimates.

The underestimation of actual dot frequency in terms of mean estimates was not observed in all subjects—a few consistently overestimated. At the lower frequencies underestimation was fairly consistent, whereas at higher frequencies the magnitude of underestimation increased. The Bevan and Turner study showed a tendency to underestimation; their result was similar to the trend in this experiment. It is as if there were two processes operating, one in which information is perceived with slightly impaired efficiency and a second process at higher frequencies where there is less efficiency. In the introduction it is stated that Taves, Kaufman *et al.*, and Jensen *et al.* had obtained evidence for the existence of two mechanisms involved in the estimation of number. The first mechanism, operating at low frequencies up to 5 or 6 dots, was termed subitizing and was independent of exposure time. In this study, the lowest frequency was 16, and it was not expected that evidence for two mechanisms would be found. There were two different mechanisms reported for these color normal subjects. One process was related to color perception and another to dispersal or zonal spread of the stimuli. Increasing the number of stimuli over the backgrounds yielded increased estimates of actual number but with diminishing efficiency.

With fixation centered in the two stimulated areas of the retina, color perception appeared in areas which were capable of giving responses to the two secondary colors, YR and YG. Estimations were affected and these zones were found to be related to both color-number and area-number effects. With regard to the area-number effect, the large area did elicit significantly higher estimates than the smaller area. The significant area-number interaction points to the peculiar effect in estimation of these two variables in combination. This interaction can be interpreted as a density effect.

In this study, since the background reflectances determined the states of adaptation, there were three adaptation levels, corresponding to white, black, and gray grounds. Although certain conditions for contrast were presented, the results of these uniform backgrounds demonstrated that black, gray, and white differences were not sufficient to affect estimation. Also color-ground interaction was not a significant conditional influence.

The complication of these findings on one sex, generally known for color normality, immediately indicates study of color weak subjects among female observers and, in addition, in male subjects who are either color normal or color weak. Recently data were collected on male subjects at Edgewood Arsenal, Edgewood, Maryland, for a more intensive study of estimations and detection of dots.

E. Conclusion

In conclusion, two stimulus colors, YR and YG, in this experiment were capable of affecting a process of estimation. Brightness variation in the background did not appreciably affect estimation. By varying the area over which the dot stimuli are spread within the normal color zonal areas, subjects were made to increase or decrease estimation values; the large area increased frequency estimates, and the small area decreased estimates. Finally, estimation is a functional process(es) and underestimations were not consistent nor constant. The subjects were extracting limited information in the complex displays.

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SOME COMMENTS ON THE PSYCHOLOGY OF THE PSYCHOLOGIST*

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It is true for many fields within the sciences and the humanities that several varieties of approaches are used as tools of discovery, and there are disagreements among thinkers as to what approach to use and what subject matter to study. Psychology seems to exceed the normal amount of diversity with regard to epistemology.

> The energy and attention devoted to discussions of role models, to problems of identity, to conflicts with other professional groups, to critical self-appraisal, and to symposia and conferences on training is [sic] striking. While I have not made any comparable survey of other professions in this regard, it is my own impression that we are at least unique in this respect, if in no other way (14, p. 354).

An uninformed reader of the literature on "how to investigate what" in psychology might easily come to the mistaken conclusion that psychology is an enterprise which is just about to start; for the argument might be that had it been going on for an appreciable number of years, one would find it hard to understand why some agreement with regard to productive approaches has not been reached.

In addition to the lack of agreement with regard to epistemology, there is another factor which poses a problem: i.e., the hostility which exists among the representatives of different approaches to psychology. Such hostility is reflected in the following quotations:

> And yet it is indeed very odd that today, in psychology, we should witness the strange phenomenon that several psychologists should, on the one side, persistently continue to argue with all tenseness and gusto against several others on the other side that these latter are as a group using unscientific methods or are indulging in philosophical psychology or mysticism or pseudopsychology, and also trying to tell them what exactly scientific methods in psychology should be like and have to be like. The displeasure of the so-called scientific psychologists with the activities

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> of those whom they regard as their less scientific and unscientific colleagues is sometimes expressed by using labels for the "scientific" groups as "behaviorists," "radical behaviorists," "social physicists," "operationists," and so on and so forth, or sometimes just "the scientists"; and it is sometimes even more acutely expressed in organized attempts, as is recently done by setting up a special exclusive group or groups to include only those of them whom the group would adjudge as "scientists" in psychology, such as the "Psychonomic Society," "Applied Psychologists," "Experimental Psychologists," "Applied Experimental Psychologists," and so on. This is odd, because in no other science do you witness this strange phenomenon! No chemists, for example, have been trying as one group to decry other chemists as another group on the ground that these others are ignorant of the true "science" of chemistry, and that the former alone know what is science and would, therefore, insist upon labelling themselves as a special wisdom group in a small distinguished organization, setting themselves against all the rest as ignorant rabble. The same is true in physics, astronomy, mathematics, geology, economics, political science or medical science. . . .
>
> In spite of the fact that some of the most important physicists, chemists, biologists, astronomers and mathematicians have also occasionally "indulged" in speculative activities which may be dubbed as more or less "meta-physical," i.e., beyond their domain of "physical reality," they are never labelled off by terms like "meta-physicists," or "meta-astronomers," or "meta-mathematicians" with a view to sharply distinguishing them from the more "scientific" scientists (23, pp. 279-280).

A refined ear gets the impression that there are irrational and deeply personal factors behind the blinders which make it impossible for one kind of thinker to see the point of view of the other, personal factors which have little to do with the rational conviction that the field of psychology will derive a greater benefit from either one or the other way of thinking.

It is the purpose of this paper to comment on the diversity of prevalent approaches to psychological problems as being a psychological problem in its own right: i.e., to consider the diversity of some approaches, the emotional cathexis focussed on their diversity, and the animosity among the representatives of the various approaches, as a topic pertaining to the psychology of the psychologist. Therefore, the psychologist is the subject of the following considerations.

The uncovering of a subjective, personal motive underlying an endeavor is often erroneously viewed as a denial of the objective value of the endeavor. The falsity of such a view will be discussed in this paper. In order to avoid the impression that I am "attacking" the work of other investigators and exempting my own writings from attack I shall use instances of my own work to illustrate different approaches.

Psychologist No. 1 (the author of this paper).

Psychologist No. 1 is sitting in a room 10 × 8 × 10 feet, facing his subject across a small table and separated from him by a screen divided into three panels. The size of the central panel is 26 inches × 30 inches and the size of the other two panels is 12 inches × 30 inches. The two outer panels are turned toward Psychologist No. 1 at an angle of 120 degrees. Twelve inches above the base of the screen and in the middle of the central panel there is a hole of 5 × 8 inches. Between Psychologist No. 1 and the screen there is a deck of 120 cards. It took time and diligence to prepare the cards. The three personal pronouns typed near the top of the cards have been selected from all existing personal pronouns by the help of random numbers, with the restriction that there is one, and only one, first person pronoun on each card. The three verbs typed near the bottom of the card have been selected at random from Thorndike and Lorge's (26) list of most frequently used words.

On the table, in front of Psychologist No. 1 there are 20 lists for each of three groups of reinforcers, which have been arranged in such a way that the order of presentation of the 10 reinforcers in each group would be random and different for each subject. Psychologist No. 1 reads the instructions, then reaches for a card with his right hand, puts it into the hole, waits until the subject has constructed a sentence with the use of one pronoun and one verb, reads a reinforcement from one of the lists if a first person pronoun has been used, and then reaches with his left hand for the card in the hole and puts it on a separate pile. After each trial Psychologist No. 1 records on a recording sheet the personal pronoun which has been selected. The informed reader will recognize that Psychologist No. 1 is using a Taffel-type design for the purpose of verbal operant conditioning.

After having completed his experiment, lasting approximately one hour per subject, Psychologist No. 1 tabulates his data. He then analyzes the data according to rules presented in a textbook of statistics. On the basis of his analysis, he confirms or rejects his hypothesis, based on journal literature, that the three groups of reinforcers will differ from each other with regard to the degree of conditioning which they produce.

Before designing his experiment, Psychologist No. 1 familiarized himself thoroughly with the literature on verbal conditioning, and especially with the differential effect of verbal reinforcers such as "Mmhm," "Good," "That's so," paraphrasing, and the like.

Psychologist No. 2 (also the author of this paper).

Psychologist No. 2 is a humanistic psychologist. He is sitting in an armchair and thinking. He has been doing much of this lately. At first his thoughts resembled free associations. Later they tended, in a vague manner, to rotate around specific topics. The training analysis which he had undergone recently had left him unfulfilled in many ways. He had observed the same lack of fulfillment in his friends who had undergone psychoanalysis. He had been treating his patients with scepticism and lack of fervor, and with only moderate success. Frankly, he did not quite know what to do with them.

What is there that would give meaning, purpose, and fulfillment? What could a psychotherapist give to his patient?

There were other centers of fantasy which seemed unconnected with the above. He had experienced the rise and fall of two totalitarian movements and had seen people being converted to totalitarian philosophies of life. He was extremely preoccupied with this topic. Sometimes he walked as in a dream into a library without being conscious of any purpose, and, as if acted upon by an outside force, found himself reading autobiographies of converts to national socialism and to communism. He read that after having attended a Nazi meeting, one convert wrote, "Now my life has meaning." The political converts had found a goal in life. But their goal is "evil" and therefore should not become a model for others.

Then his mind took a turn. Could totalitarian movements be cleansed of their evil aspects? Would what remains be a philosophy of life worth aspiring to? The thought led him to reading autobiographies of mystics and saints. Like converts to totalitarianism they had experienced despairing hopelessness before "the light struck them." Here was conversion without evil.

In a flash a connection was established between the blandness of the psychotherapist's experience, on both sides of the desk, and the boundless richness of the experience of conversion. Why does the psychotherapist not avail himself of the wells of mental health which "nature" provides? When trying to help people who lead "unlived lives" (13, p. 207), why does he not consider the philosophies of life which people create spontaneously to make their lives meaningful? Thus, a bond was established between psychotherapy and the concept of conversion. The outcome of the union was a brief article entitled "Some suggestions concerning *Weltanschauung* and psychotherapy" (29).

The article states that a certain amount of nondirectiveness is a characteristic of most schools of psychotherapy: it is viewed as desirable that the patient "blossom out from the inside," rather than being guided from the outside. This view, according to the paper, is a rationalization of the fact that the Western world is lacking a philosophy of life on which to base external guidance, for the therapist himself is a lost Western man, as is the patient. Thus, the stress of client-centeredness in therapy might be perceived as making an asset out of a cultural liability. Then, in contrast to the stress on inner potentialities, the assumptions are stated that the absence of a Weltanschauung is a prevalent etiological factor in neuroses and that a partial function of psychotherapy is to help the patient develop a Weltanschauung. The question is raised whether different components of philosophies of life might be therapeutic to a different degree for people who differ with regard to personality structure, nosological group, and the like. An ethical value system, the belief in a purpose of life, the formation of an ingroup and of outgroups, the bestowal of meaning upon unavoidable suffering, are given as examples of such components.

The modes of operation of Psychologist No. 1 and of Psychologist No. 2 have been described above. They are so different from each other that it is hard to believe that both call themselves "psychologists."

Psychologist No. 2 has been characterized by Shaffer (25) as follows:

> In the framework of a common empiricism, some of us find the most convincing reality in our *immediate* observations. That which is real and truly believed is sensed and felt at first hand. . . . Let us call this attitude intuitive; it is the preference for knowing by immediate and direct processes without intervening steps of formal interpretation (25, p. 608).

Below is Shaffer's description of Psychologist No. 1:

> In contrast, other psychologists place their trust in *mediated* observations. The raw stuff of experience is ordered and quantified, and is reduced to neat columns of numerical data. When so arranged the observations can be expressed with precision and brevity in terms of central tendencies and variances, can be compared with other data, and most importantly, can be subjected to tests of statistical significance. For a convenient and simple designation, let us call the belief in mediated and ordered experience the *objective* attitudes (25, p. 608).

The two psychologists differ with regard to many dimensions. It is hoped that the following will pinpoint the aspects of the differences between them which are pertinent to the present discussion. The two approaches described above are, of course, not the only approaches to psychology; it would be possible to describe Psychologist No. 3, No. 4, No. 5, and so on, representing other types of approach.

What are some of the factors which explain the choice of different approaches to psychology? What role does his particular approach play in the personality configuration of the psychologist? Shaffer (25) and others have researched this area and have formulated pertinent hypotheses. What follows are additional hypotheses regarding the role which some approaches to psychology might play in the personality configuration of the psychologist.

Here it becomes necessary to digress. Maslow (20) distinguishes between two kinds of motivation—deficiency motivation and growth motivation. The difference becomes apparent in a statement by Allport quoted by Maslow.

> Deficit motives do, in fact, call for the reduction of tension and restoration of equilibrium. Growth motives, on the other hand, maintain tension in the interest of distant and often unattainable goals (20, p. 29).

It might be assumed that the production of a good researcher or theorist is the result of growth motivation to a greater degree than of deficiency motivation. It seems plausible that the problem which the psychologist tries to clarify by research or theorizing represents a challenge for which he joyfully reaches out beyond himself and voluntarily gives up the state of homeostasis, of balanced equilibrium.

However, growth motivation of the researcher or theorist is often accompanied by deficiency motivation. It is deficiency motivation that this article is going to focus upon, for even though it might be small in proportion to the total motivation, it may have far-reaching consequences. One way in which research or theorizing might be the result of deficiency motivation is based on the fact that activities like research or theorizing may counteract anxiety. Since anxiety destroys the condition of homeostasis, the desire to assuage anxiety may be viewed as deficiency motivation. That the anxiety of not being promoted in one's job might be counteracted by activities leading to publications is obvious and will not be discussed here. Instead, the anxiety-reducing function of investigatory activities will be considered in relation to the two approaches described above.

Anxiety is an unavoidable aspect of life. The human condition is characterized by existential anxiety—with regard to death, to the necessity of giving up some potentialities in order to develop others, to the threat of having to make decisions without sufficient information, to the seeming lack of external sources which could exert guidance and bestow meaning to life, to the contingencies of fate which cannot be controlled, and to ontological isolation and aloneness (8, 27). In addition to anxieties shared by all men there are individual anxieties in every life.

The psychologist is confronted by further causes of anxiety stemming from the subject matter with which he deals. He frequently selects areas of investigation which are connected with his own personal problems. This is true for Psychologist No. 2 described in this paper, and it is true more often with regard to psychologists whose approach resembles the one taken by Psychologist No. 2 than the one taken by Psychologist No. 1. Not everybody will agree with psychoanalysts who claim that every patient shows resistance against the uncovering of his unconscious conflicts, but it is generally accepted that facing one's own problems can be anxiety producing. Even if areas of investigation that the psychologist undertakes are not obviously related to his personal problems, dealing with them may more likely trigger off anxiety than dealing with subject matter which is entirely unrelated to human behavior. Bakan (2) believes that the rise of behaviorism can be explained partially by the fact that the introspectionists developed excessive anxiety with regard to threatening personal content which entered their thoughts in the course of introspection, and therefore abandoned this line of investigation.

There are many ways of evading anxiety. Bordin, Nachmann, and Segal (7) have investigated occupational choices as a function of the need to reduce anxiety. Almost any activity can serve to reduce anxiety, since it "fills up time" and creates embeddedness and security.

A more specific way is exemplified in the approach taken by Psychologist No. 1. An activity which inevitably leads to anxiety is free association. It is risky to loosen control over one's thoughts and to think about anything which comes to mind. Free association may be the road to creative thinking, but it is certainly a road which may lead to very unpleasant thoughts (16). Therefore, why not avoid the sometimes torturous flow of free association as much as possible and focus one's thoughts upon a circumscribed area?

The avoiding of free association is exactly what Psychologist No. 1 does. When starting his research he has a definite hypothesis in mind, together with a prescription for testing it. Before an hypothesis is formulated the scientist's approach resembles the work of Psychologist No. 2, as will be discussed later. With regard to Psychologist No. 1, it has been stated that he took his hypothesis from the literature, suggesting that he may have completely avoided the state of free-floating attention. At least during his working day, Psychologist No. 1 does not have to think about the anxiety-producing complexities of life. Focussing on one topic always implies defocussing with regard to other topics. Psychologist No. 1's road is prescribed and his reality is narrow and tightly structured (30). For days, weeks, months, or years he engages in occupations such as "running" his subjects, and tabulating and analyzing his data, which require concentrated, effortful attention.

It can be assumed that deficiency motivation aiming at the reduction of anxiety is only a small part of the researcher's total motivation to do his work, but it is that small part which is considered in this article. Everyone who has ever done rigorously controlled research, including myself, may have experienced the narcotizing bliss of research routine, a bliss which is cruelly interrupted on Sunday when there is no work to do. Research routine is superior to occupational therapy in the reduction of anxiety, since it carries considerable prestige and is performed with the researcher's conviction that it is done for the sake of scientific progress rather than for the sake of the attainment or maintenance of his emotional equilibrium. I have pointed out elsewhere (31) that activities which are performed for the purpose of attaining "mental health" are less likely to produce mental health than are activities directed toward goals other than mental health and in which mental health ensues as a byproduct.

A warning is long overdue. A researcher who is deeply convinced that his investigatory method is valid may consider it superfluous to look for subjective roots of preference for such method. He may look at the insinuation that such subjective roots might exist as implying doubt regarding the objective justification of his method. Yet, uncovering the subjective motivation of an endeavor, even motivation of the deficiency variety, is not an attack on the objective value of the endeavor. An endeavor may be highly constructive even though it is based on the desire to avoid anxiety. Deficiency motivation may give impetus to valid and invalid behavior. The statement that the fight against alcoholism may be a reaction-formation against an excessive and anxiety-producing desire for oral gratification leaves unanswered the question of the social value of such fight. Psychologist No. 1's approach is appropriate in many cases even though it might be in part deficiency motivated by the desire to avoid anxiety, if the deficiency motivation is only a small part of the total motivation.

The statements in the above paragraph, claiming no relation between subjective motivation and validity, require some modification. A man whose subjective needs are fulfilled by careful saving of money behaves appropriately as long as he is poor. However, if he still saves excessively after becoming a millionaire, his behavior is inappropriate. Similarly, if Psychologist No. 1 succeeds in escaping from anxiety (deficiency motivation) by using rigorous experimental methods, he is liable to use his approach, which may be highly constructive in one context, in other contexts where it is inappropriate. He will fail to adapt his method to the problem to be solved. In other words, he will engage in what Maslow (19, pp. 13-21) calls means centering. Thus, two concepts originated by Maslow appear to be causally related—deficiency motivation and means centering.

It has become apparent that both the above concepts are related to a third one—the concept of defense against anxiety. This concept will now be discussed more explicitly, with the focus on a specific mechanism of defense—isolation (10, 37f, 46f). Isolation is the process of severing from the experience itself the threatening notions with which the experience is cathected; the separation leads to a reduction of threat and consequently of anxiety. In a broader sense, isolation denotes the division of threatening areas into fragments to such a degree that the areas will not be recognized as anxiety producing, the conversion of Gestalten into collections of elements, the exclusion of threat from a wide range of reality by focusing on a narrow range of reality. The isolator tends to see trees rather than woods; he has an inhibition to perceive Gestalten. Isolation is a favorite defense mechanism of obsessive-compulsives.

Scientific activity requires a certain degree of "isolation," the isolation of variables, the exclusion of a wide range of phenomena in order to study a small range of phenomena, the use of abstractions, such as quantification, whereby certain aspects of reality are singled out and others are neglected. Isolation can serve to gain knowledge *and* to avoid anxiety; it can be growth-motivated or deficiency-motivated.

Since there is a similarity between the defense called "isolation" and certain scientific methods, individuals who favor isolation as a defense may tend to adhere to the scientific methods because they resemble their favorite defense mechanism. It is needless to say that such a comparison does not insinuate that all No. 1-type psychologists are compulsive; it merely suggests certain formal resemblances between a "normal" investigatory method and pathological deviations. The above should not be perceived as a reductionistic view that scientific activity is nothing more than a neurotic symptom. Scientific activity is of course infinitely more than a neurotic symptom, but it can in some cases fulfill the function of a neurosis.

The people whose investigatory approach is determined by its resemblance to favored defenses can be said to engage in a kind of mimicry behavior. Desirous of conforming, they attempt to channel "peculiar" forms of behavior into areas where these forms of behavior cease to be peculiar, where they are common, appropriate, and even desirable.

> In all systematic thought, there is a tinge of pedantry. There is a putting aside of notions, of experiences, and of suggestions, with the prim excuse that of course we are not thinking of such things (32, p. 2).

When engaging in mimicry individuals behave like a man who finds it difficult to stand up straight because of a physical abnormality and therefore decides to choose an occupation in which the external situation demands a bent position. His mimicry behavior helps him to deceive himself and others about the cause of his position. His posture seems to be caused by the demands of external reality rather than by factors within himself.

Individuals who adapt by mimicry tend to stick to certain methods of operation with considerable rigidity even when their behavior is no longer appropriate. Should some technical innovation make it possible to accomplish their task with a straight posture, they would lose interest in it: they tend to be means centered, since their personalities are so deeply interwoven with specific methods. It was pointed out before that deficiency motivation with regard to the choice of a methodological approach aiming at the reduction of anxiety may lead to means centering; now it becomes even more apparent how the scientific methods used by the deficiency-motivated individual may be determined by his habitual defense mechanisms against anxiety, and therefore be difficult to modify. "Stupidity and intelligence have one root," Landauer (17) writes, "namely, the need to ward off the threatening aspect of reality. The intelligent person takes cognizance of ideas and submits them to abstraction; the dull person withdraws from ideas" [(17, p. 21); translation by the present author].

Comments similar to the ones made about Psychologist No. 1 might be made about the behavior modifier. Behavior modification may be a highly effective mode of treating patients, and the fact that it may be anxiety reducing also for the therapist does not detract from its effectiveness. The similarity between Psychologist No. 1's approach and behavior modification becomes apparent when the latter is compared with, for example, existential therapy. Here the therapist confronts the patient with the vague idea in mind that his goal is to help the patient detect "who he is." The therapist is supplied with no prescriptions, no narrow road on which to travel; even his knowledge of the exact meaning of "who the patient is" is vague. The therapist permits floods of associations to pour into his thinking, carrying the creativity, the joy, the anxieties, the tensions, the grievances of the therapist's entire life.

The following quote shows that Freud (12) felt that a therapist must be open to any thought which may occur—the patient's thoughts, as well as his own thoughts:

"All conscious exertion is to be withheld from the capacity for attention. . . ." (12, p. 324).

"One has simply to listen and not to trouble to keep in mind anything in particular" (12, p. 325).

"It is not a good thing to formulate a case scientifically while treatment is proceeding, to reconstruct its development, anticipate its progress, and take notes from time to time of the condition at the moment, as scientific interest would require" (12, p. 326-327).

". . . the most successful cases are those in which one proceeds, as it were, aimlessly, and allows oneself to be overtaken by any surprises, always presenting to them an open mind, free from any expectations" (12, p. 327).

Self-involvement which might lead to anxiety is dramatically portrayed in Rogers' (24) writings:

> I launch myself into the therapeutic relationship having a hypothesis, or a faith, that my liking, my confidence, and my understanding of the other person's inner world, will lead to a significant process of becoming. I enter the relationship not as a scientist, not as a physician who can accurately diagnose and cure, but as a person, entering into a personal relationship. Insofar as I see him only as an object, the client will tend to become only an object.
>
> I risk myself, because if, as the relationship deepens, what develops is a failure, a regression, a repudiation of me and the relationship by the client, then I sense that I will lose myself, or part of myself. At times this risk is very real, and is very keenly experienced.
>
> I let myself go into the immediacy of the relationship where it is my total organism which takes over and is sensitive to the relationship, not simply my consciousness. I am not consciously responding in a planful or analytical way, but simply in an unreflective way to the other individual, my reaction being based (but not consciously) on my total organismic sensitivity to this other person. I live the relationship on this basis (24, p. 267).

In contrast, the behavior modifier follows a prescribed path as does Psychologist No. 1 and so avoids the danger of opening the floodgates. I once saw a Rogerian therapist choking up with emotion when he reported, at a meeting, about an especially moving scene which occurred during group therapy. When I told another psychotherapist about this incident he said, "I am glad I am a behavior modifier."

Psychologist No. 1 is protected from anxiety which may be produced by threatening psychological discoveries in still another way. He resembles the miller's apprentice in a romantic song by Schubert. The apprentice asks the creek, "Why are you so mute? There is only one of two little words I want you to say. The one word is yes [the miller's daughter loves me] and the other word is no; the two words encompass the entire world for me." Psychologist No. 1 might say the same to his computer. His effortful research will yield only one of two words, either yes (the null hypothesis cannot be rejected), or no (3). These two words encompass the entire range of his investigation. The risk of being surprised is nil.

Now let us focus our attention on Psychologist No. 2. Unlike Psychologist No. 1, he does engage in free association. He does not focus his thoughts upon a circumscribed area. When starting his endeavor he does not have a definite hypothesis in mind, nor does he have a definite prescription for testing the hypotheses which he develops during a later stage of his thinking; indeed, he does not seem to feel the need to test his hypotheses. At first sight, it seems as if he made no effort to protect himself from thinking about the anxiety-producing complexities of life. His reality is boundless and unstructured. He does not engage in activities such as "running" subjects and tabulating and analyzing data: he does not have any data to analyze. It would be misleading to say that he tries to protect himself from anxiety by effortful attention to his topic, since thinking of the kind in which he engages to erect his speculative edifice requires an effortless state of suspended attention (28) which "leaves the mind open" to creative as well as threatening thoughts. He cannot avail himself of the narcotizing bliss of rigorous research routine. His endeavor "is as 'messy,' confusing, multifaceted, and disorderly as life itself" (30, p. 698). Psychologist No. 2's mode of operation resembles, in many ways, the mode of operation of writers and artists.

It is assumed that Psychologist No. 2's acceptance of speculation is not merely an expedient, not merely due to the circumstance that complex problems are frequently elusive to objective methods. Instead, it is suggested that many investigators have a penchant towards speculation.

It would be easy to say that Psychologist No. 2 does not use his "research" as a defense mechanism against anxiety, and end the article at this point. A comparison of this kind between Psychologist No. 1 and Psychologist No. 2 appears to be biased.

Speculation may indeed serve as a defense—of a different kind from the defense used by Psychologist No. 1.

Vague thinking may be a defense, since it leaves much leeway for projections and speculations, and makes it possible for the observer to defend himself against the threatening aspects of reality by distorting them and thus perceiving them in a less threatening manner.

Children frequently avoid facing reality about sexual matters by inventing fantasies about them which seem more acceptable than the so-called facts of life. For example, children who are reluctant to accept the crude facts about birth frequently develop speculative theories which seem more engaging, beautiful, and dramatic. Little Hans (11, p. 155) engaged in speculation when he saw his baby sister naked, saying that her "widdler [penis]" was still very small and would get bigger when she grew up. By the help of speculation, he protected himself from the threatening insight that there are people without a penis. Thus, childhood grievances and other frustrating circumstances can be corrected by the help of speculative systems.

> The mind is an instrument that grinds its axes unconsciously more often than consciously: trying to prove points that it has to prove and not hesitating to strain the truth in the effort to achieve this goal. In other words, unconscious conflicts and necessities which are carried over from the nursery, from childhood, and from schooling, reappear in many disguised forms throughout life. They may be expressed in an effort to disprove something which is true; or conversely they may drive a man to attempt to prove the impossible. Or they may drive the creative zeal blindly in an effort to resolve some ancient dilemma, to pay an old debt or to settle an old grudge, to achieve the unattainable goal of a childhood fantasy, or to lift the curse from something which in childhood had been an overwhelming source of pain, humiliation and terror (16, pp. 60-61).

Moreover, speculative edifices protect the speculator from what Milner (21) calls the "implacable otherness" of the world (21, p. 138). Such edifices originate most frequently as reflections of the speculator's private thoughts, fantasies, wishes, problems. The reflections are, "by fiat," ascribed to the world in general, and as a result the speculator feels one with the world: "If all my hunches are true there is no danger that my union with the world will be destroyed." The line of demarcation between the subjective and the objective vanishes, and the speculator experiences a blissful feeling of oneness with his surroundings. Scott Fitzgerald's confidant says: "By God, if I ever cracked, I'd try to make the world crack with me (4, p. 407)." World views that are seemingly very depressing may, paradoxically, offer support if they carry the message that "Life is how you see it; your feelings correspond to reality. You are in contact with the world around you."

Why should Psychologist No. 2 test his hypotheses? Why should he take the risk of having his beautiful assumptions murdered by a bunch of cruel facts? Why should he curtail the feeling of magic power arising from the conviction that he can sit in his armchair and emit thoughts which, magically, seem to be valid with respect to the outside world?

It has been said above that the mode of operation in which Psychologist No. 1 engages resembles the defense mechanism of isolation. Similarly, the mode of operation in which Psychologist No. 2 engages resembles the defense mechanisms of projection and of intellectualization (10, chap. 12).

At this point, it seems necessary to repeat the caveat stated above. The fact that an investigator obtains some personal gains from a speculative approach to his field of investigation does not mean that such an approach is without value. For example, speculation is highly desirable during the initial phase of research in which hypotheses are in the process of being formulated.

Even though the mode of operation of Psychologist No. 2 resembles the mechanism of projection, it must be kept in mind that there is a special kind of projection, called sensitization, which sharpens rather than blurs perception. A hostile person who projects by ascribing his own hatred to others might do so only if others are really hostile; he might discover subtle hostility in others which is gullibly overlooked by everyone else. Thus, projection may blur or sharpen our vision.

Nourished by subjective preoccupations, speculations of the investigator may lead to valid results. It has been shown for example that subjects perceive food in fleeting pictures of food more frequently when the subjects are starved (1, 18). Semmelweis discovered that childbed fever was caused by physicians who conducted autopsies just prior to examining women and so infected them. Semmelweis made this discovery during a period of his life when, for a variety of reasons, he was personally preoccupied with the idea "men infect women." By projecting his private preoccupations upon the outside world he made a highly valid discovery (15). Polanyi (22) suggests that the results of scientific discoveries are not mere replicas of reality such as maps, time tables, or telephone directories; instead, discoveries come about by the merging of objective observation with subjective preoccupations.

As has been suggested, both Psychologist No. 1 and Psychologist No. 2, besides being motivated by genuine desire for knowledge, may have subjective or personal reasons for using their specific approach to psychology. Psychologist No. 1 may ward off a variety of threats to his personal equilibrium by confining himself to the narrow focus demanded by rigorous scientific methods. Psychologist No. 2 may gain equilibrium by a loose and speculative approach because speculation enables him to transform, in fantasy, a world full of threats into a world with fewer threats, and because a view which makes the world a replica of his inner self creates union and integration and relieves the feeling of aloneness. In a very broad sense, the psychologist's personal motives which exist side by side with objective motives could be called defenses.

While it has been said that both empirical and speculative investigatory endeavors may be justified from an objective viewpoint, the fact that Psychologist No. 1 and Psychologist No. 2 both "do their own thing" may have certain disadvantages. Since the approach of Psychologist No. 2 is more appropriate for the first phase of an investigation when hypotheses are being formulated, and the approach of Psychologist No. 1 is more appropriate for the second phase when hypotheses are being tested, stubborn adherence to either approach may lead to truncation of the scientific process. As Rogers (24) has pointed out in a beautiful article, the full arc of the scientific process consists first of insights gained by an I-Thou relationship with reality and second by rigorous testing of the validity of the insights gained [see also Polanyi (22)].

> Out of this complete subjective immersion comes a creative forming, a sense of direction, a vague formulation of relationships hitherto unrecognized. Whittled down, sharpened, formulated in clearer terms, this creative forming becomes a hypothesis—a statement of a tentative, personal, subjective faith.
>
> . . . What I am describing is the initial phase of science, probably its most important phase, but one which American scientists, particularly psychologists, have been prone to minimize or ignore. It is not so much that it has been denied as that it has been quickly brushed off.
>
> . . . Thus scientific methodology is seen for what it truly is—a way of preventing me from deceiving myself in regard to my creatively formed subjective hunches which have developed out of the relationship between me and my material (24, p. 275).

As Bateson says ". . . the advances in scientific thought come from a combination of loose and strict thinking, and this combination is the most precious tool of science" (5, p. 55).

I believe that the defensive aspects of scientific methods lead to deletion of one of these two phases, since individuals tend to stick to their favorite defenses which have been reinforced in the past. (Even though I am both Psychologist No. 1 and Psychologist No. 2, I do not exempt myself from the accusation of truncating the scientific process, since I have used each of the two approaches separately in two different investigations rather than combining them in one and the same investigation.)

Also, the partial determination of approaches to psychology by personal defenses may explain the irrational hostility which exists among psychologists using opposite approaches.

> The issue is permeating and it is warm. One characteristic of a strong personal belief is the emotional fervor with which it is held and the equally emotional animosity with which its opponents are condemned. Objectively oriented persons are likely to call intuitive people "senti-

> mental," and "wishful," and "unscientific." The latter retort that the objectivists are "cold," and "narrow," and "unimaginative." Such epithets bring no solutions and no mutual understandings (25, p. 608).

Though both Psychologist No. 1 and Psychologist No. 2 may have been convinced that their respective approaches are determined by objective factors alone, the knowledge that another person, also a psychologist, uses a diametrically opposed approach may create doubt regarding the objective justification of one's own approach. Psychologists using diametrically opposed approaches may threaten each other's defenses, and the threat may create mutual animosity. Psychologist No. 1 may view Psychologist No. 2 in the same manner in which a prim and proper Victorian lady views a woman of doubtful reputation.

During psychoanalysis the therapist "destroys" the patient's defenses by making them conscious. Just as personal conflicts may be mitigated by having the unconscious, irrational factors behind the conflicting motives brought into consciousness, epistemological group conflicts may profit from awareness of subjective roots. It may well be that this article can serve a similar purpose for psychologists with different approaches.

> The creative life in general makes extraordinary demands on the human personality. Specifically in science, creativity demands a flexibility which is perhaps greater than that of almost any other occupation to which man can dedicate himself. Precisely because the scientist must be as imaginative and free in fantasy as a poet, artist, or musician, and at the same time as tightly organized as the builder of bridges or the man who organizes and plans the split-second timing of an atomic explosion, we ask that the creative scientist should have a high degree of emotional and psychological freedom and imaginativeness coupled to an equal degree of organized precision. Few other occupations demand so much. I am not unhappy that science makes this demand of us. I am unhappy only at the fact that we do not recognize the implication of this demand and do nothing to help even the most gifted scientists attain the degree of emotional maturity and freedom which would make it possible for them to use their intellectual endowments in the most creative and constructive way that is possible for man to attain. I am unhappy at our complacency with a primitive educational process which to so large an extent re-enforces everything neurotic in human nature (16, pp. 81-82).

"I believe that comprehending our irrationalities would free us to cope with our problems in a more constructive and adaptive manner than now seems likely" (9, p. 333).

If psychologists were to become conscious of the defensive nature of their approaches, they might cease to be means centered and instead, adapt their method to the objective requirements of the search for knowledge. Then a miracle may occur: Experimental psychologists may take a broad view of human nature and humanistic psychologists may settle down to collecting data.

The difference between diametrically opposed approaches as exemplified by Psychologist No. 1 and Psychologist No. 2 can be interpreted in still another manner. Most psychologists are men. It is the traditional role of middle class men in our culture to select such occupations as business, banking, medicine, physical or biological sciences, and the like. The focus upon the inner life is often viewed as a prerogative of women. The man who becomes a psychologist may, consciously or unconsciously, feel that he has made an "effeminate" choice. Put on the defensive, he may want to show to himself and to others that he is as manly as his colleagues who are physicists, chemists, engineers, and the like, by the blatant use of rigorous methods and brass instruments. His approach to psychology may convey the message: "Even though I am a psychologist, I am really not investigating psychological problems. After all, I am a man." He may give the impression that he wishes to reverse his original choice of becoming a psychologist: his behavior is closely related to the defense mechanism called denial (10, chaps. 6, 7).

Psychologists of this kind are frequently threatened not so much by other psychologists of the No. 2 type, but by clinical psychologists who openly declare that they want to help people. I have heard the latter called names, such as "bleeding hearts," by psychologists of opposed approaches. A psychologist with strong scientific orientation once said to me: "Imagine! Dr. X really wants to help people!" To the unbiased observer, helping people does not seem to be such an extravagant goal, but to the psychologist who views himself as a rigorous scientist it may appear threatening to share his profession with people who "take care" of others, for taking care is part of the feminine role in our society.

I believe a study of the derogatory adjectives which experimental psychologists use to characterize psychologists of opposite approaches might reveal that they are similar to derogatory adjectives used by men to characterize women.

In contrast, No. 2 type psychologists, and many practicing clinicians spend a lifetime speculating, intuiting, empathizing, feeling, applying unresearched practices to their clients. Never do they approach their subject matter with a sharp, dissecting, analytical mind. Have they decided to give up the masculine role altogether and constitute a *"berdache"*[1] in the midst of our sex-roleriented society? If so, it would be unfortunate, since creation occurs only if he masculine approach is combined with the feminine approach; what is true or human reproduction is also true for science, art, and many other fields of endeavor.

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[1] *Berdache* is an institution found in primitive tribes according to which some men wear female clothes, engage in female occupations, and, more generally, lead the lives of women (6, p. 227).

A final statement: To the reader who has had the patience to read this article to the end it must have become apparent that it was written by Psychologist No. 2 rather than by Psychologist No. 1.

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THE PROJECTED BRAIN ILLUSION*

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A. INTRODUCTION

This paper describes a bizarre visual phenomenon that I have never seen described in the scientific literature.

B. STIMULUS CONDITIONS

The projected brain illusion (PBI) can be observed on a very dark night by anyone with normal vision, and a candle. The flame of the candle should be about six inches in front of the observer's mouth and moved very slowly from left to right and up and down until PBI occurs. I find that moving the candle very slowly in the shape of an ellipse in front of the face to be an efficient way of loctaing the best position of the candle for observing PBI. When PBI is observed all motion of the candle is stopped and PBI can then be observed at length. The direction of vision is straight ahead, slightly above the candle light, and fixation is at infinity—a sort of blank stare into the surrounding darkness. See Figure 1.

There should be no moonlight, preferrably overcast, and the surrounding conditions should be as dark as possible. No objects should be close enough to be seen by the reflected light from the candle. PBI is an ephemeral phenomenon, but once the experience occurs it is, like the blind spot, easily reproduced. It may be possible to get a maximally clear PBI under controlled laboratory conditions, such as a large dark gymnasium or black walled dark room and by means of a rheostat controlled electric light which can be varied in intensity.

C. ILLUSORY RESPONSE

PBI is seen at approximately 60 centimeters in front of the forehead. It has a diameter of approximately 40 centimeters with maximum clarity at the center and a boundary that is ill-defined and fades to total darkness.

The structure of PBI looks remarkably like pictures of the human brain;

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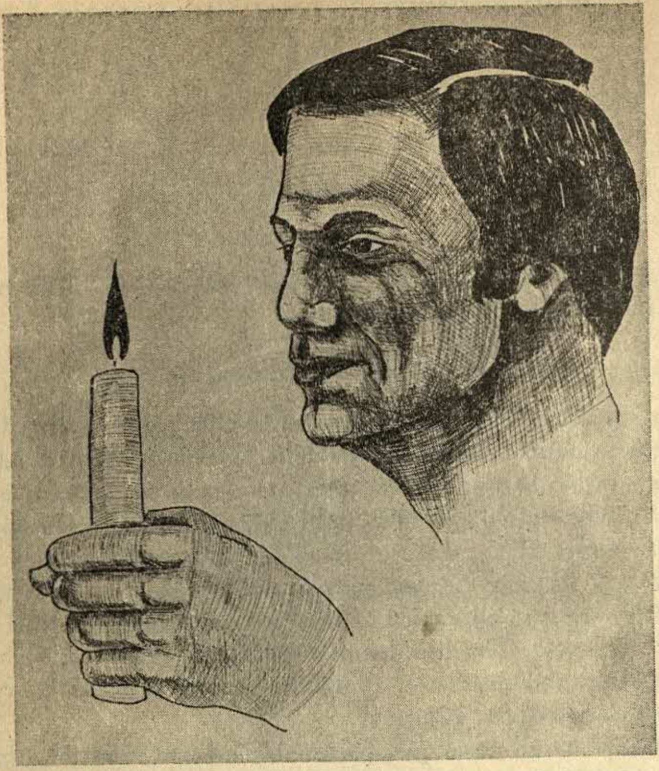

FIGURE 1

DEPICTION OF RELATIVE STIMULUS CONDITIONS AND LINE OF FIXATION FOR PBI

hence, its name. The main part of the figure is beige tinted gray interlaced with sharply defined black lines which terminate in pointed ends.

Our Figure 2 looks much like Gregory's (1) description of the eye as seen through an opthalmoscope in his Figures 4-5. There are several interfaces of structures on which the retina could be reflected *forward,* similar to the endless images seen when looking into two facing, reciprocal mirrors.

When viewed binocularly one visual field is seen and this field is the field observed by the dominant eye of the observer. By closing one eye, then the other, two different PBIs can be observed. The emotional quality of the first observation of PBI is best characterized as an "ah ha!" experience. See Figure 2.

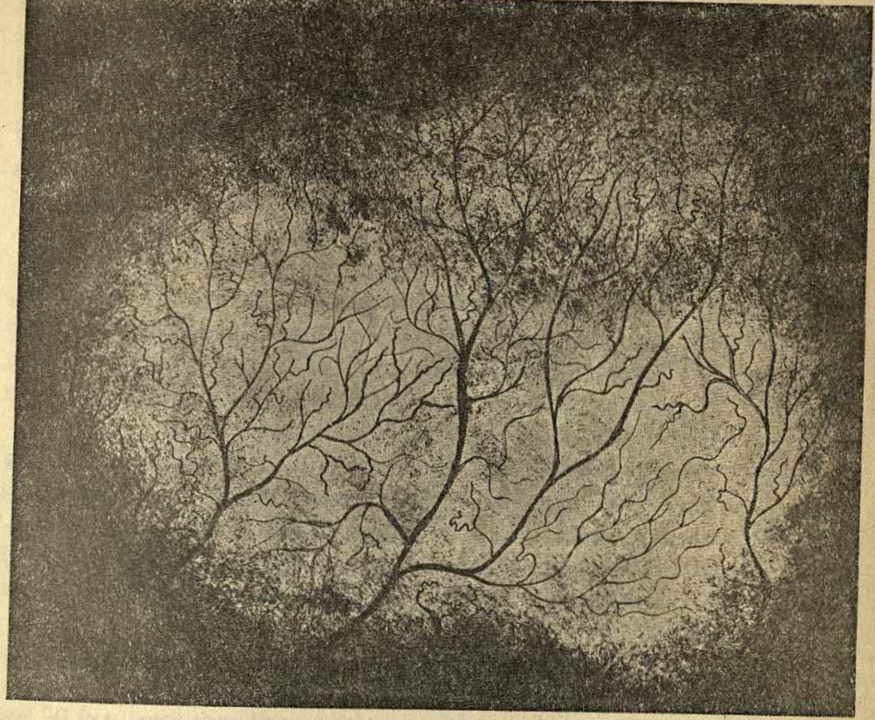

FIGURE 2
ARTIST'S IMPRESSION OF THE VISUAL RESPONSE IN THE PBI

D. DISCUSSION

PBI seems to be a genuine illusion rather than an hallucination or a direct observation, since it is viewed as "out there."

It does not seem to be based upon some special attribute of the optic nerve or the optic chiasma. Nor does it seem that we are actually seeing the occipital cortex but, rather, some attribute of the eye itself.

A plausible basis for PBI seems to lie within the structure of the eye itself. However, since the diameter of those parts of the eye through which light passes is at most one centimeter and since PBI is about 40 centimeters in diameter, it is obvious that some kind of magnification occurs.

But what, precisely, is magnified? Several possibilities present themselves: the cornea, the lens, the retina, etc., or one of the surfaces or interfaces of these optic structures. Because of the special position of the candle and the nature of reflection of surfaces it would be my own guess that PBI is essentially a magnification of some aspect of the cornea thrown into exceptional relief by the special lighting conditions and point of regard.

What is the basis of magnification? The two possibilities are geometric optics and physical optics. Geometric optics explains well optical phenomena occurring in telescopes, microscopes, and lens systems generally. Even though the eye does have a lens and a curved cornea, we do not believe an explanation of the magnification effects in PBI to be due to geometric optics because surfaces or structures of the eye would be well within the plane of focus and, therefore, should appear as fuzzy or out of focus. On the contrary the lines and aspects of PBI are sharp and clear.

The best explanation of magnification effects would seem to lie in the field of physical optics. Physical optics has to do with light passing through very small slits or passing by very small objects. When the widths of slits or objects approach the size of the wave length of light passing through them, phenomena occur which are not predictable from geometric objects. One of these phenomena is a kind of spreading or magnification. It may be possible, therefore, that what is being seen is the microstructure of the cornea magnified by physical optic effects.

This last statement could be reformulated as an hypothesis and tested in the experimental laboratory. One possible experimental design would be to observe PBI under two different lights—yellow and blue. Magnification of both the overall microstructure and the interdistances between parts of the visual field should be quite different because the wave lengths of the two kinds of light are different.

After experimental analysis of PBI has been made, there may be useful applications of the phenomenon. It is possible that ophthalmologists or optometrists may find PBI useful in diagnosis, evaluation, and prescription.

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SOCIAL SCHEMAS: A DEVELOPMENTAL STUDY*

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A. INTRODUCTION

This is a developmental investigation of what has been called social schemas: i.e., learned meanings of human situations (2), by means of having *S*s arrange cut-out felt figures of humans and nonhumans on a board. Previous investigators have used adults as *S*s (1, 2, 3, 4, 5, 6, 7, 8). Uniformities in placements have been found, which Kuethe calls social schemas.

Kuethe regards social schemas as response sets which "cause" a particular arrangement; Fischer (2) interprets them as "learned meanings of human situations" which are "expressed through" various tasks.

The authors propose to test the generality of such phenomena by expanding the age range of *S*s from 3- and 4-year-olds through 15-year-olds with the use of the free placement technique.

B. METHOD

There were 214 *S*s: 14 3- and 4-year-olds in a university nursery school and 20 *S*s at each year from six through 15 years of age who attended a public school. All were white; half were boys, half girls at each age. *S*s were selected only according to age and sex. *S*s were asked individually to place 11 sets of figures on a 2′ × 3′ felt-covered board in any way they wished. See Figure 1 for the figures used. For the analysis, *S*s were grouped: the younger group, 3- and 4-year-olds plus 6- through 10-year-olds ($N = 114$); and the older group, 11- through 15-year-olds ($N = 100$).

The data were investigated as to (*a*) sex and (*b*) age differences, (*c*) size-ordering, (*d*) placement of child in relation to female, and (*e*) prosocial arrangements of profiles.

The sets and figures were presented in a random order. Set 1 consisted of M (man) W (woman) M; set 2, W M W; set 3, 3 M in profile, two facing left, one facing right; set 4, W W M, the first W facing right, the other W and M facing left. The next six sets were all full-face: Set 5, M W C (child);

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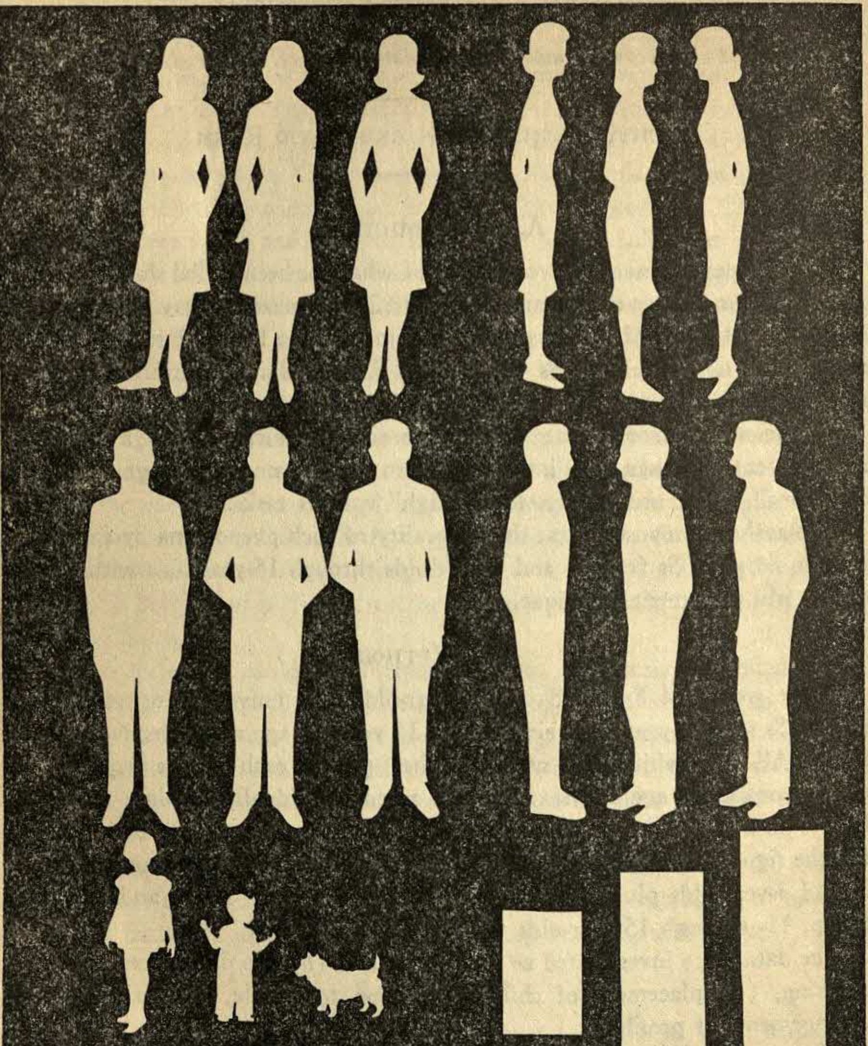

FIGURE 1
THE FELT FIGURES USED IN THE EXPERIMENT

set 6, M C B (baby); set 7, W C B; set 8, M W D (dog); set 9, C B D; set 10, M W C B. Set 11 was comprised of three rectangles, small (S), medium (M), large (L). Arrows (←) or (→) are used to denote orientation of profile figures.

C. Results

1. *Sex Differences*

Boys and girls did not differ in their placement of any of the 11 sets of figures at any age level.

2. *Age Differences*

There were age differences in placing the figures. For example, in set 1, M M W, there were three possible placements: M M W, M W M, and W M M. For this set both older and younger *S*s put the female between the two males (M W M)—$\chi^2 = 37.70$, $df = 2$, $p < .0005$. The chi-square value denotes the chance of M W M being chosen over M M W or W M M.

However, in set 2, W M W, although the younger *S*s showed no strong pattern preference, the older *S*s preferred to place the male in the middle (W M W)—$\chi^2 = 14.47$, $df = 2$, $p < .001$. Thus, the older children were like the adult *S*s in Fischer's study (3).

3. *Size Ordering*

When *S*s arranged set M W C, the younger group placed C between the two adults ($\chi^2 = 24.204$, $df = 5$, $p < .0005$); older *S*s, however, apparently used a size ordering of M W C ($\chi^2 = 66.939$, $df = 5$, $p < .0005$). Size ordering also obtained with set M C B for both groups of *S*s ($\chi^2 = 91.209$, $df = 5$, $p < .0005$); and for set W C B ($\chi^2 = 30.364$, $df = 5$, $p < .0005$). Set M W C B was also preferred in that order by all *S*s ($\chi^2 = 615.999$, $df = 23$, $p < .0005$); and rectangles were arranged either L M S or S M L ($z = 4.34$, $p = .00003$). Further evidence of size ordering was the 54 percent who chose either M W D and D W M rather than one of the other four possibilities (M D W, W D M, D M W, W M D), and the 54 percent who chose D B C and C B D *vs.* the four patterns of D C B, C D B, B D C, and B C D. Rectangles, large, medium, small were also arranged by size or height by 61% of *S*s. Thus, a comparison of all sets which could be size-ordered suggests that this factor is highly significant in children's arrangements of front-facing figures ($\chi^2 = 156.848$, $df = 5$, $p < .0005$).

4. *Child in Relation to Female*

Kuethe (5, 6) had found that his adult male *S*s placed C closer to W than to M. *S*s in the present study did not place C closer to W, but over 80% placed C next to W rather than to M. It should be noted, however, that a large portion of the variance is probably due to size-ordering.

5. *Prosocial Arrangements*

Fischer (2) had found that figures facing each other were placed farther apart by adult *S*s than those facing away from each other or in the same direction. Two sets of profile figures were used in this study; one was three M (M → M →← M) and one was two W and one M (W →← W ← M). The prosocial arrangement—i.e., all figures facing (M → M →← M)— was heavily favored ($\chi^2 = 88.793$, $df = 2$, $p < .0005$). A developmental trend was noted, since 77% of the older *S*s chose the prosocial arrangement *vs.* only 57% of younger *S*s. And, whereas facing figures were placed farther apart (58% farther, 22% closer, $p < .0005$) by all *S*s, a developmental trend was shown by 78% of the older *S*s who placed figures farther apart *vs.* 68% of the younger group.

*S*s also preferred prosocial arrangements in the other set of profiles (W →← W ← M). Of the total scorable arrangements of 196, 83% had at least one pair facing each other and 64% had all profiles facing each other. The latter pattern was used by 56% of younger *S*s and 74% of older *S*s. There were no sex differences, but twice as many of the child *S*s had two women facing each other as a man and woman facing each other. All distances between the figures were carefully measured and analysis of use of greater distance between facing figures yielded a binomial z value of 4.356, $p = .00003$. Results were not significant for younger *S*s ($p = .0968$), but were highly significant for older *S*s ($p < .0001$).

D. DISCUSSION

Thus, there were some clear developmental progressions when children arranged the sets of figures which may reflect increasing awareness of social schemas, of how people "go together." The older *S*s put M in the middle between two W as adults had done (3); more older than younger *S*s preferred prosocial arrangements as in Fischer (3) and Fischer (2); more older than younger *S*s placed facing figures farther apart as in Fischer (2).

As in previous studies with adults, no sex differences were found.

Size-ordering and family structure of M, W, C or M, W, C, B were interrelated in this study. Both seemed to influence heavily the *S*s' choices. The comments of the *S*s reflect these two influences. At all ages, many said "Well, they're families." "Put the father first, then the mother, then the children." "I put them by the size." "The man, woman, child, and baby are a family having their picture taken." A 13-year-old said "I just put them in the most logical way, the oldest to the youngest." Their comments also add validity to Kuethe's concept of social schemas which "function to structure ambiguous situations involving human objects" (5) and Fischer's refinement that "social schemas are the learned meanings of human situations" (2). One *S* said "Just the way people go sometimes." "The little girl holds the baby's hand and they had a dog." "I thought of things that could have happened and might have happened." "I put the people like they were talking." "The man and woman would hold on to the children and wouldn't let them run in the street." The Ss perceived these felt figures as representing real situations and injected meaning into their arrangements of the figures. There were no sex differences, but there were developmental changes with increase in age so that the older children performed like adult *S*s, as reported in previous investigations.

E. Summary

The 214 *S*s who ranged in age from 3 through 15 years demonstrated a regular and strong developmental progression in the way they arranged felt figures, which showed increasing awareness through learning of how people "go together" in human situations and, with increase in age, performed more like adults, as reported in previous investigations.

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INDUSTRIAL PSYCHOLOGY IN *PSYCHOLOGICAL ABSTRACTS,* 1927-1969*

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A. INTRODUCTION

The purpose of this study is to contribute towards a history of industrial psychology by the use of the *Psychological Abstracts* from its inception in 1927 until 1970. In so doing the author is perfectly aware of the fact that even historians are now de-emphasizing the importance of history. For example, Duberman, in *The Uncompleted Past* as reviewed by Wiecek (21), expresses a doubt that many historians are currently beset with: namely, the concern whether "history is possible or relevant" (21, p. 23). In a study of the industrial psychology contributions in the *Annual Review* from the time of its inception in 1950, the author (14) found evidence of the fact that the past is still with us. "The past is never dead. It's not even past," is the way Faulkner has Gavin Stevens put it in *Intruder in the Dust* (21, p. 24). From Wiecek we learn that "the late Sir Lewis Namier, possibly Britain's greatest historian in this century, once said with as much truth as paradox that men 'imagine the past and remember the future.' " This he interprets to mean that "men read into the past the characteristics of the present, and draw on erroneous analogies from history to predict the course of events." The remedy he gives is "a thorough knowledge of history is the only corrective for the dangerous effects of this backwards-and-forwards mythologizing." On the assumption that recorded facts of history can be of help to give us some insight on the "there and then" of industrial psychology in the light of which we can evaluate the "here and now" for future goal-orientation, this study was made.

Many claims have been made over the years concerning the rapid growth of the field of industrial psychology. Haire (9, p. 169) expressed what he considered to be a fact in what he chooses to call "the segment within psychology devoted to problems related to industry"; it is one which he thinks many of us do not realize and, if fully considered, is striking. This is in accord with the assumptions about the growth of the whole field of psychology: namely,

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that it has grown in numbers, research, dollars, and range of topics covered—as expressed or assumed in the special issue of the *American Psychologist* (3) devoted to a consideration of the place of psychology in the university.

The availability of the *Psychological Abstracts* as a source makes it possible to compare output year by year in a given field from the time of its beginning in 1927. The articles are abstracted in brief and do not lend themselves to evaluative study of the nature, comprehensiveness, or quality of the publications; but they do lend themselves to a count study, making possible a comparative study of output over the years. By comparing the number of articles reported in any given year with any other given year, it is possible to compare productivity considered in terms of output per year and to observe increases and decreases over the years. By so doing, it is possible to discover in what years the gains have been made, the extent to which they have been sustained over the years, and the general growth trend as far as output per person is concerned. To measure the extent of growth considered on a year by year basis, as well as to compare this with output per person by comparing the output to membership in Division 14 of the APA is the purpose of this study. More specifically, what is included in this study is an investigation of growth trends considered in terms of (*a*) increase in total productivity as reported in the *Abstracts* on a year by year basis; (*b*) growth in membership; and (*c*) productivity trends considered in terms of output per person.

B. CONTRIBUTIONS REPORTED IN *Psychological Abstracts,* 1927-1969

All the articles appearing in the *Psychological Abstracts* under the categories signifying "Industrial" and "Personnel" psychology were tabulated for the purpose of making the comparative growth study over the years. From 1927, when the *Psychological Abstracts* first appeared as a separate monthly, until 1959, these appeared under the major categories of "Industrial Psychology" and "Personnel Psychology" (with sections classified as "Industrial and Personnel Problems," "Personnel Psychology," and "Industrial and Other Applications"). In 1959 and 1960 the main captions used for categorizing the various studies were "Personnel Psychology" and "Industrial and Other Applications." From 1961 through 1965 the main caption was "Industrial and Military Psychology." From 1966 to 1968 this became "Military and Personnel Psychology," and more recently, 1969 to the present, the more sensible title, "Personnel and Industrial Psychology."

The number of articles abstracted annually from 1927 to 1969, inclusive, is reported in Table 1. The data reported from 1927 to 1946 are taken from tables reported by Flanagan (8, p. 145) in his contribution to personnel psychology in the 1947 University of Pittsburgh studies on current trends ir psychology. In summary fashion these data are presented by Meltzer (12 p. 332). Here, considered in terms of decades, there is reported a definite increase, jumping from 150 in 1927 to closer to an average of 250 in the 1930's and hitting above 500 in 1946. This last spurt was described at that time as an overflow of war-accumulated studies in psychology and psychiatry. The relevant data for productivity from 1927 to 1959 are taken from the original article (13), and the data from 1959 through 1969 have been worked up and arranged for reporting in the present article. The relevant data concerning productivity over the years from 1927 to 1969 are presented in Table 1.

TABLE 1
INDUSTRIAL PSYCHOLOGY ARTICLES IN *Psychological Abstracts*, 1927-1969

Year	Number	Year	Number	Year	Number	Year	Number
1927	150	1938	267	1949	522	1960	548
1928	179	1939	217	1950	543	1961	680
1929	247	1940	313	1951	577	1962	539
1930	333	1941	164	1952	448	1963	684
1931	244	1942	290	1953	550	1964	564
1932	274	1943	314	1954	668	1965	639
1933	247	1944	360	1955	778	1966	680
1934	344	1945	317	1956	667	1967	707
1935	262	1946	593	1957	603	1968	773
1936	259	1947	404	1958	394	1969	654
1937	269	1948	456	1959	981		

What does a study of Table 1 show about the growth, extent of productivity over the years, gains sustained, and the general trend considered in the light of increase in the present number of contributors who are identified with the field of industrial psychology? As presented in the earlier article (13), the data presented up to 1959 show an increase at times, but the increases are not continuous and not sustained. Whatever the reasons be, there were peak years—1930, 1934, 1946, 1951, 1955—but they have been preceded and followed by leaner years. As reported in the *Abstracts*, it seems that industrial psychology cannot stand prosperity and has its recessions. Outstandingly low years were 1939, 1941, and 1958. From 1959 to 1969 the picture is relatively similar in nature. The year 1959 is an extremely productive year—the highest in all the years of the existence of the *Psychological Abstracts*—with 981 contributions, preceded by only 394 in 1958, and followed by 548 in 1960. Thereafter, it is typically close to 600, running all the way from 539 in 1962 to 773 in 1968. Low years are 1960, 1962, and 1964 when, in the order named, the output was 548, 539, and 654. All the other years are above 600. In only two years was the number above 700; 707 in 1967, and 773 in 1968. However, this was followed by only 654 in 1969. So, the same trend indicated in the 50's again shows up in the 60's: namely, that industrial psychology cannot stand prosperity and has recessions, downs as well as ups, lean years as well as peak years.

To avoid, or at least reduce, the possibility of one set of circumstances or effects unduly influencing or distorting the output of any given year as an index of a general trend, we have tabulated the data in spans of three years. So viewed, the discontinuity and inconsistency of trends appear lessened, but they are still there. What shows up this way is a total output of 576 articles in the first three years, and 851 and 853 articles in successive three-year spans, ending with 1935. From 1936 to 1942 there is a six-year period of decrease, from 795 for the first three years to 694 for the last three, ending in 1941. From 1942 to 1957 there is a general increase, considered in three-year spans. For the three years beginning with 1942, there are 964 articles. The total for 1945, 1946, 1947 for the first time is above 1000 articles for every period through 1956. The lowest year in more than a decade was 1958. In the three-year span beginning with 1959—1959 to 1961 inclusive—there were 2209 contributions. In the next three-year span, 1962, 1963, and 1964, there were 1787 contributions. In 1965, 1966, 1967 there were 2026 contributions. The total in 1968 and 1969 for the two years is 1427. All in all, it is running close to 2000 per three years; and whatever the reasons be, the three-year span including 1962, 1963, and 1964 is significantly lower. A glance at Table 1 indicates that it was 1962 and 1964 that lowered the total. The year 1963 held its own as compared with other years in the 60's. There is one trouble with making comparisons on an annual basis: namely, some journals make the authors wait a year or more before publication. In the three-year span, one would expect that to be reduced; however, two low years are too much to keep up with. It would probably be worthwhile to review the possible reasons for this and for the ups and downs in general, and these are considered in the following section.

C. EXPLAINING INCREASES AND DECREASES OVER THE YEARS

How can the fluctuations and variations, the ups and downs reported in Table 1 be explained? The 1958 recession was used in the earlier article (13) as a possible explanation for the low number of abstracts in that year, but that explanation is probably questionable. More likely is the specific evidence that the abstracts were not well covered due to changes in the Editorial Office during that period. For example, in the February, 1959, issue of *Psychological Abstracts,* there were almost 200 abstracts under "Personnel Psychology" and "Industrial and Other Applications," all of which were published in 1957, except eight books and three articles published in 1958, and three articles published in 1956. This may be a usual backlog, though it seems somewhat delayed and may in part be responsible for the low count in 1958. In 1959 there apparently is an accumulation of articles not published in 1958 because of delays in the Editorial Office. That is a more likely explanation for the extremely large and unsustained number of contributions reported in 1959. Considering contributions in three-year spans does give a better index of the likely sustained, contributing productivity. The relatively low contributions in 1962 and 1964 may, in part at least, be explained by a shift in Editors. That there was evidence of some confusion in the Editorial Office with the shift of Editors, the writer has learned from correspondence with Dr. Horace B. English, Editor from April, 1959, through December, 1960. In 1962 the Editor (16), in his Preface advised that he was introducing a new system of coding the *Abstracts* to replace the numbering system. This was supposed to be extremely helpful, not only to his staff, but also to all the readers. It turned out that the coding system was too confusingly complex for the readers so that it was discontinued at the end of the year. For the writer, it merely meant counting articles for this year rather than depending on the numbering system. Also, *Psychological Abstracts* apparently does not cover European literature as well as it might. According to Adams (1) roughly only 30% of the publications considered as major contributions to the field by Austrian and German psychologists are abstracted. A more conscious attempt to improve this situation was made by some of the more recent Editors.

Who edits the Abstract can make a difference, and the Editors have changed over the years. In the early years the American Psychological Association was fortunate in having the same Editor for a long number of years: namely, W. S. Hunter from the beginning in 1927 until the end of 1946. He was followed by C. M. Louttit from 1947 to August, 1956, who was followed by Allen J. Sprow from October, 1956, until the end of 1958. Sprow was succeeded by Horace B. English beginning in February, 1959, and ending in December, 1960. Clifford Morgan took over in February, 1961, and continued until December, 1963. In February, 1964, P. J. Siegmann is listed as the Editor and continued until October, 1969. From November, 1969, Robert Sadacca is listed as the Editor. It should be remembered that the *Psychologi-*

cal Abstracts, which started as a monthly, changed to a bimonthly in 1954 and continued so until 1966. From 1966 onwards it has been published monthly again with cumulative, semiannual indexes. The number of abstracts contained in each issue is markedly larger, of course. As a matter of fact, Van Cott (20, p. xv) advises us that "Each subscriber is exposed to approximately 20,000 or more abstracts each year."

D. Are More Contributors Producing Less?

When considered in terms of output in relationship to number of potential contributors, what is the picture of productivity in the field of industrial psychology as indicated in an analysis of contributions reported in *Psychological Abstracts*? As reported in an earlier article (13), if we consider membership in Division 14 as potential contributors, we can compare the gains made in membership to the amount of productivity. In 1948, Division 14 had 108 Fellows and 78 Associates. In 1958, the Division had 250 Fellows and 409 Members, which represents a total increase of 354%. In spite of this increase in membership and individual potential contributors of articles that would be listed in the *Abstracts,* the expected increases do not appear. In 1948, the approximate output per member was 2.45. In 1958, it was only .60. In the most productive year up to 1959, which was 1955, when the Division had 213 Fellows and 301 Associates, the output per member was 1.51. What has happened in the 60's can be more clearly and fully presented in the light of data available for these years. The data include information about (*a*) membership, (*b*) total output per year, (*c*) output per person over the years, and (*d*) the number of Doctorates over the years in industrial psychology. All the relevant data for considering the productivity problem in the 60's are presented in Table 2.

From 1959 on, growth of membership has been less rapid than in previous years. As can be seen in Table 2, in 1959 there were 713 Members, and in 1960 there were 734. It remains in the 700's until 1963 when the number has grown to 839. It does not grow in 1964; actually there is a reduction of two Members, from 839 to 837. In 1965 the number goes up to 931 and thereafter keeps going up towards 1019 in 1967, but there are only 956 in 1968. The largest number is in 1969—1074.

The information about Doctorates over the years has been furnished the author by Dr. Owens, the 1969-1970 President of Division 14. The first Doctorate reported was in 1946; in 1947 there was 1; 1949—1; 1952—3; 1954—9; 1955—11; 1956—18; 1957—27; 1958—28; and 1959—43. The

TABLE 2

PRODUCTIVITY IN INDUSTRIAL PSYCHOLOGY IN THE 60's

Year	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Membership	713	734	756	775	839	837	931	968	1019	956	1074
Productivity (total)	981	548	680	539	684	564	639	680	707	773	654
% Productivity per person	1.36	.74	.90	.69	.81	.66	.68	.70	.69	.80	.60
Doctorates in industrial psychology	43	31	31	38	44	50	38	48	59	27	

number from 1959 onward is reported in Table 2. A survey of all these numbers indicates that it was slow beginnings, with no Doctorates in some years like 1948 and 1953. It is interesting that in 1959 there were 43 Doctorates, and in the next three years this dropped to 31, 31, and 38. Not until 1963 was there one more Doctorate than there was in 1959; namely 44. The largest number was in 1967 when there were 59, but that went down to only 27 in 1968. The data for 1969 are not available to the writer. My general impression is that as we move into the 70's, it is likely to be less rather than more, because a number of schools have announced that they are taking in fewer candidates.

If you look at productivity considered in terms of output per person, it is apparent that the largest year is 1959. This is, in part, explained by the fact that it is preceded, as well as followed, by significantly smaller numbers. Apparently, this has something to do with the backlog in the *Psychological Abstracts* in its way of reporting rather than representing productivity, as such, only. In the 60's the output per person is always markedly less than 1; the highest is .90 in 1961. The median is .69. But, in the 60's, as well as in the 50's, it can be said that the general picture is that with substantial increase in numbers, though the ratio of increase is less in the 60's than the 50's, the productivity is not increased on anything like a proportional basis.

How does productivity of the industrial psychology group compare with other groups? In an article on "Productivity Rate in Research Scientists" (7) is reported the number of publications per year in the years 1959 to 1964 for a group of 40 research scientists. The number was 4.81 for those who worked in universities, 1.05 for those who worked in industry, 4.5 for those who worked in government, and 4.41 for the total. That this is significantly larger than the productivity of the psychology group is understandable. Even in the research scientists' group for the people working in industry, the research output is significantly less. This fact is relevant for considering what is happening in the field of industrial psychology as the Division membership increases, with a smaller ratio of people working in the universities. There is no doubt that a larger number, considered in terms of ratio of total membership, now work in industry or in fields where emphasis on research and publication is not influenced by a "publish or perish" kind of attitude, as prevails in universities. Then, of course, the skew that is reported in all studies of research work, no doubt, characterizes productivity of members of Division 14. In addition, as indicated by Levy (11), in Clinical the distribution of the contributions tends to be extremely skewed; 28.9% of Rabin's group had no publication to their credit, 19.2% had only one publication, and 10% of the group accounted for 45% of the output. Barclay (4) presented some evidence which indicates that the skew characterizes psychologists of every Division, not just Clinical Psychology. So, it is not surprising that we find that kind of skew in Industrial. As a matter of fact, the skew in Industrial, and the findings here reported, that more contributors are producing less, holds even more so for the Clinical Division (15, p. 464).

All in all, a review of all the data presented under the caption of "Are More Contributors Producing Less?" indicates the answer to be a definite yes. All the pictures of rapid growth, as indicated by some of the writings of both Haire (9) and Kunin (10), are definitely not in line with the facts as revealed by this study of actual productivity over the years. But growth of a kind there has been. There is an increase in membership. There has been some increase in people studying in the field. But the gains have not been consistently sustained, and there are other signs of growth that students are influenced by; for example, there are an increasing number of consulting organizations doing managerial and organizational work which have grown substantially, in terms of both number of organizations and people in the field. How many of them are as productive as they would be if they were teaching in university positions could be a special study worth making. The odds are that people in industry and organizations are definitely less productive than people in the university. Frank Uhlmann, in personal correspondence which Dr. Owens reflected on in the November issue of the 1969 *TIP,* reported that from the three *APA Directories* that he had, Diplomates in Industrial decreased from 183 in 1963 to 140 in 1968. Of these, 38 were in the 1966 *Directory* and not in that of 1968.

As reported by Dr. Owens (19, p. 2), the Industrial Division increase in membership from 1949 to 1957 was 373; from 1958 to 1963—180; and from 1964 to 1969—187. In this report Dr. Owens compares the growth with the Clinical Division, which increased from 1949 to 1957 by 800 Members, whereas Division 14 increased less than half as much as membership in Division 12, but twice as much as Division 3—Experimental. The second time period, 1958 to 1953, is described by him as being subsequent to Sputnik, and "money has now begun to flow into 'basic research '" of Division 12. "Division 3 is now growing as rapidly as we are." In the period 1964 to 1969 "the relative status of the three divisions seems to be essentially unchanged." Dr. Owens quotes Miss Gates as saying, what he considers germane: namely, "It is my impression from salary data and position openings that there is a fairly large demand for industrial psychologists, and that this demand has not been followed by an increased supply." Relevant data of this nature are reported in an article on the "Employment Status of Recent Recipients of the Doctorates" by the Office of Scientific Personnel of the National Research Council (18). The subcaption of this article is "Doctoral graduates in science and engineering have found professional employment despite a tightening job market." This article attempts to get facts to have as a base for reacting to reports and rumors of unemployment among Ph.D.'s. The study is based on questionnaires mailed on December 26, 1969, to 4406 chairmen of academic doctoral departments of natural and social sciences, engineering, and mathematics, requesting their assistance in determining the employment status. For "employment suitable," the percentage given for psychology in 1969 is 78.4. Mathematics is the only field that rates higher, and this has a percentage of 86.3. All other fields rate lower. Engineering is 77.5, Physics is 62.8, Chemistry is 61.8, and the Earth Sciences are 71.5. Biochemistry rates extremely low—29.6. A comparison of Psychology to other fields reported in this article shows Psychology never to be the most favored, but to stand up relatively well as compared to other professions. Data reported include "employment irrelevant," "unemployed," and "temporary postdoctoral." The general feeling around campuses at the time of this writing (Fall, 1970) is that jobs for 1970 are less available then ever, both for industrial and academic positions. In the summary of this article is expressed the somewhat gloomy attitude that "apprehension that appropriate positions would be even less available than they were last year is running high. It is hoped, however, that the difficulties facing doctoral graduates and causing some of them to despair, may again be mitigated by a job market that, in the outcome, proves to be sufficiently large, even if it is one of changing character" (18, pp. 938-939).

E. Summary and Discussion

The purpose of this study is to examine the extent of the growth considered in terms of contributions reported in *Psychological Abstracts* from the time of its inception in 1927 until the present. By the use of that kind of analysis as compared to membership in Division 14 over the years, a study was made of the total productivity of the group as a whole, but also of the output per person on a year by year basis. The latter is to test whether the trend, found in the earlier study (13), still prevails: namely, that more contributors are producing less.

The findings in this study may be summarized as follows: (*a*) There has been a relatively general trend towards an increased amount of number of articles abstracted or reported in the *Psychological Abstracts* over the years. The gains are more readily seen when compared in decades. For example, from 1927 to 1937 the increase was from 150 to 269. From 1938 to 1948 the increase was from 267 to 456, and from 1949 to 1959 the increase was from 522 to 981. However, it should be remembered that the 981 is a relatively abnormally large year for reasons explained in the article. In the 1960's, starting with 548 in 1960, there have been ups and downs, with the highest number of contributions reported in 1968—773—but this went down to 654 in 1969. Only in the period from 1942 to 1956 is there a sustained, continuous gain. (*b*) There have been peak years and also lean years. Quite often peak years were preceded or followed, or both, by lean years. Some of this may be due to mismanaged backlogs on the part of the *Abstract* Editors. Other possible reasons are considered in the article. (*c*) The productivity trend considered in terms of output per person goes down as membership goes up. While membership has increased almost fourfold in the 1950's, individual output in the most productive years up to 1959—the year 1955—is less than twofold. In the 1950's with the exception of 1959, generally there is a decrease in individual productivity. A similar trend shows up in the 1960's. The productivity considered from the point of view of output per person was highest in 1959. In the 1960's it starts off with .74 in 1960, and is less than .70 in 1962, 1964, and 1965. It is .70 in 1966 and higher in 1968—.80; and it is .81 in 1963, and .90 in 1961. (*d*) The number of Doctorates in the various universities which offer Ph.D.'s has increased over the years, but in recent years the growth trend has not been steady. As a matter of fact, 1968 has less than half as many as 1967—27 as compared to 59.

In analyzing the foregoing results concerning the relatively decreasing output considered per person, it should be remembered that industrial psychology is not the only field that is characterized by a skewed distribution in productivity of members. Barclay (4) presents evidence which indicates that the skew characterizes psychologists of every Division. So, Industrial is merely one of the areas that fits this picture of skew. Dr. Kenneth Clark (6, p. 464), in his "Survey of the Behavioral and Social Sciences: Psychology," reports the growth picture of total number of psychologists in the APA and ends that discussion with the statement that ". . . fewer than 4000 contribute to our archival literature." Both Clark (6) and Albee (2) indicate that the growth in membership is in the applied area more than in the basic research areas. It should not be at all surprising that, if the realities of the kind of work the people in the field of industrial psychology are doing and where they are employed are considered, the productivity, with increasing numbers, has been going down. Eiduson (7) indicates that research scientists in industry are markedly less productive, averaging 1.5 as against 4.5 for people working in the university. Clark (6) says that less than 40% of the APA members are employed in colleges and universities. The percentage of all psychologists who are members of departments that award Ph.D.'s is nearer to 15%. Men in industry, whom Baritz (5) chooses to call the *Servants of Power,* are no less productive than people in clinical practice; and, although both fields are nowhere as productive as it would be well for the profession to have them, they are not completely unproductive.

In 1960 (13) the need appeared to be for more relevant research by psychologists in industrial settings or consulting organizations and therefore closer to emerging realities on the industrial front. To some extent this has taken place. More people in industrial settings in consulting organizations have been publishing, even as reported in *Psychological Abstracts;* however, an increasing number of them are contributing in sources whose articles are not included in *Psychological Abstracts.* Still needed is more integration between people whose chief interest is in the profession of psychology, and whose concern, therefore, is with relevance, and psychologists whose chief interest is in science and whose primary emphasis is on rigor. The need today is for significant studies that are not only relevant, but also as rigorous as possible. It is becoming increasingly clear that in the training of professional psychologists, particularly in the industrial area because of its moving in the direction of increased interest in organizational behavior, the need is for enrichment of Industrial Psychology as has been offered in the past with courses in social, clinical, and community psychology. Also, it would be advisable for students of organizational behavior to be aware of the fact that people in the fields of political science, sociology, and education are contributing to that area of knowledge.

The problem, then, is not controversy between relevance and rigor, but increase in significant contributions to the field of industrial and organizational behavior. In this connection it is well to keep in mind the advice given by Lewis Mumford (17, p. 120) not to ignore ". . . Leibnitz's salient distinction between accurate knowledge and adequate knowledge." The need, that is to say, is for more significant contributions that are adequate.

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The effect of interest on *horizontal décalage* at the stage of formal operations . . . 141
BY WILLIAM M. BART

Alcohol dose effects on feedback-maintained simple reaction time 151
BY DWIGHT SUTTON AND JERRY BURNS

Political and religious beliefs of Catholics and attitudes toward involvement in the Vietnam war 161
BY DANIEL J. BAER AND VICTOR F. MOSELE

Allelomimetic behavior system: Distress vocalization and social facilitation of feeding in Telomian dogs 165
BY J. M. COMPTON AND J. P. SCOTT

Effect of questions on visualized instruction 181
BY FRANCIS M. DWYER

(OVER)

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Dominance-submission in profoundly retarded male subjects under conditions of strong motivation 185
By Charles C. Cleland, Reuben Altman, and Jon D. Swartz

Psychology of the pain experience 193
By John B. Murray

Perceptions across the life span of important informational sources for children and adolescents 207
By William R. Looft

Investigation of some variables influencing stereotypy in interpersonal perception 213
By Anees A. Sheikh and Patrick A. Miller

Creativity, dogmatism, and arithmetic achievement 217
By John D. Williams, Steven D. Harlow, and Jerome S. Borgen

Self-concept, sports interests, sports participation, and body type of seventh- and eighth-grade boys 223
By Donald W. Felker and Richard S. Kay

Semantic differential analysis of men's first names 229
By E. D. Lawson

The effect of right and wrong guesses on two-choice reaction time . . 241
By Martin Hannes

Detection of vibrotactile signals differing in probability of occurrence . . 253
By George A. Gescheider, John H. Wright, and John W. Polak

Questions as advanced organizers in visualized instruction 261
By Francis M. Dwyer

Nonverbal rigidity and severity of criminal offense in a group of juvenile delinquents 265
By Stephen Breskin and Philip G. Burchill

Infant reactivity to redundant proprioceptive and auditory stimulation: A twin study 269
By Leland D. Van den Daele

Values and value systems: Importance and relationship to managerial and organizational behavior 277
By Andrew F. Sikula

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THE EFFECT OF INTEREST ON *HORIZONTAL DÉCALAGE* AT THE STAGE OF FORMAL OPERATIONS*[1]

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William M. Bart

A. Introduction

To Jean Piaget (6) the stage of formal operations is characterized by the capacity to think in a hypothetico-deductive manner and by the capacity to consider all the possible relationships in a problematic manner. Piaget and his Genevan associates (6) determined empirically that this stage arises in Swiss children in early adolescence during the ages of 12-15 years. As one enters into higher phases of the stage of formal operations, one increases in his competency at formal operational skills and in the generalizability of formal operational skills to various contents. The Piagetian construct of *horizontal décalage* at the stage of formal operations is similar to the notion of generalizability of formal operational skills.

In general, the Piagetian concept of *horizontal décalage* refers to the time interval between the application of certain cognitive-stage operations to a task and the application of the same operations to another task (11). An example of *horizontal décalage* can be found among the conservation studies (2).

In a study of conservation (e.g., conservation of weight), the intent is to determine the salient traits (e.g., age) of subjects that relate to the capacity to discover those attributes of an object that remain invariant with respect to substantive changes in other attributes. For example, in a conservation of volume study a subject who is shown two equal-sized objects may be asked if one of the objects takes up more space than the other object after the experimenter transforms one of the objects. Conservation of quantity concepts are susceptible to the notion of *horizontal décalage,* for Piaget and Inhelder (11)

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and David Elkind (2) determined that the conservation of mass becomes common at 8-10 years of age, whereas the conservation of weight becomes common at 10-12 years of age and the conservation of volume only at 12 years of age and after. The example of *horizontal décalage* with respect to conservation of quantity concepts is primarily manifest at the stage of concrete operations. Though Piaget does not explicitly discuss *horizontal décalage* at the stage of formal operations, the author assumes that it is directly applicable.

By citing the phrase "intersituational generality," which is descriptive of *horizontal décalage,* and by empirically determining that there is a trend for increased intersituational generality at the stage of formal operations, Mary Ann Stone (12) demonstrated the applicability of *horizontal décalage* at the stage of formal operations. However, there has been minimal explanation as to why formal operational behavior will be initially manifested with respect to one topic or situation and not with respect to another topic or situation. In personal correspondence, Kenneth Lovell (7) has suggested that formal operational behavior will be initially manifested with respect to topics for which the individual has considerable knowledge. Elkind (2) has commented that an adolescent entering into the stage of formal operations will be selective and will be guided by his interests as to what problematic areas he will attend to. This view by Elkind is the basis for the hypothesis that formal operational behavior will be initially manifested only with respect to topics of interest to the individual. The research reported here deals primarily with the testing of the following hypothesis: The affective factor of interest has a decreasing differential cognitive effect at the stage of formal operations. It is hypothesized that an individual will manifest formal operations initially with respect to topics of interest and only years later with respect to topics of disinterest. Thus, the cognitive effect of interest at the stage of formal operations is hypothesized to decrease with an increase in experience at the stage of formal operations.

B. METHOD

1. *Subjects*

Ninety adolescents form the Chicago area were used in this study: 30 scholastically above-average students from each of three age levels—13, 16, and 19. (Since the stage of formal operations was examined, it was assumed that most pupils over 13 years of age and with above-average scholastic achievement would have formal operational capabilities according to Piagetian findings.) Thirty 13-year-olds were from the "honors" eighth-grade classes in a

Chicago elementary school; 30 16-year-olds were from the "reserve" and "honors" classes in a Chicago high school; and 30 19-year-olds included 20 female nursing students from a Chicago school of nursing, nine male undergraduates from two Chicago universities, and one male graduate student from the University of Chicago. All 90 students were volunteers as they expressed a willingness to participate in research on adolescent thought processes.

There were 32 males and 58 females in the sample. This condition of disproportionate sex sampling should not detract from the results of the study, for there is substantial evidence that there are no sex effects with respect to formal operational skills (9, 12).

2. *Instruments*

a. Interest inventory. Each subject indicated his degree of interest for each of 30 activity items on an interest inventory. (Each of the activities could be categorized in only one of three content areas: e.g., "studying butterflies" is an activity that is related to biology.) Each item was rated on a seven-point Likert scale anchored on the extremes by the bipolar adjectives: interesting-uninteresting. Ten of the items tested for degree of interest in literature; 10 for degree of interest in history; and 10 for degree of interest in biology. From these 30 item scores, three content area scores were obtained as the summative values of their respective constituent item scores and ranged from 10 to 70. The items in each set of 10 ranged in activity type from indicating physical activities with concrete objects (e.g., "watching the wildlife in a forest") to indicating mental activities involving abstractions (e.g., "determining what the nature of biology is").

The content validation of the items was determined in three phases. First of all, two high school teacher specialists for each content area agreed that the activities cited for their specific content area actually pertained to that content area. Second, the inventory item categorizations into content areas by two high school teachers were identical and in line with the hypothesized categorizations according to content area. Third, the Spearman rank-order correlation coefficient for the pairs of item rankings for each content area along a concrete-abstract dimension performed by two high school teachers was greater than .95, thus indicating that the items for each content area were ordered along a concrete-abstract activity dimension.

b. Formal reasoning instruments. To test for formal thought, a set of 60 items was prepared that conformed to four specifications established for formal reasoning items. These items were basically logic items that provided either abstruse or absurd information and required for their correct solution the selection of the unique answer among six conclusions compatible to the given information. The specifications for the items were the following:

(*a*) the task for each item requires a simple deduction through the use of either propositional rules of inference or quantificational rules of inference in order for the validly deducible response to be recognized;

(*b*) each item has either absurd (contrary-to-fact) declarative or imaginary declarative premises—i.e., each premise in each item must be either contrary to a fact that the subject knows to be a fact or must be an imaginary statement that has no concrete referents and is beyond the experience of the subject;

(*c*) each item has unary and binary connectives (e.g., "if . . . then," "not," "either . . . or") being used in the premises;

(*d*) it is indicated to the student in each test that he is to assume that the premises for a given item are true.

These specifications are attributable to John Flavell (3), Albert Morf (8), and Jean Piaget (10).

Example items used in the biology, history, and literature formal reasoning tests respectively with the number of the correct answer choice underlined are the following:

(*a*) Manatees are reptiles if and only if lemurs are birds. Therefore . . .
  1) if manatees are reptiles then lemurs are birds.
  2) manatees are not reptiles and lemurs are birds.
  3) manatees are reptiles and lemurs are not birds.
  4) manatees are reptiles.
  5) manatees are not reptiles.
  6) lemurs are birds.

(*b*) All blue Trojans are Picts. Therefore . . .
  1) if all individuals are blue then all Trojans are Picts.
  2) all individuals are blue.
  3) all individuals are blue Trojan Picts.
  4) all individuals are Trojans.
  5) all individuals are either blue or Trojans.
  6) all individuals are Picts.

(*c*) Hamlet is more heroic than Siegfried. Hamlet is less heroic than Tamburlaine. Therefore . . .
  1) Hamlet is the least heroic of the three men.
  2) Siegfried is the least heroic of the three men.
  3) Tamburlaine is less heroic than Hamlet.
  4) Siegfried is the most heroic of the three men.

5) Hamlet is the most heroic of the three men.
6) Tamburlaine is the least heroic of the three men.

The tests were intended to determine the propositional reasoning capabilities of the individual. Formal operations have been defined as operations that can be performed on propositions to generate logically consistent propositions (6); these second-order operations were being tested for with the formal reasoning test items. Though many factual and informative terms, such as "Hamlet" and "lemurs," were used, these tests should not be construed as measures of information, since the informative terms were solely sources of confusion, misdirection, and conceptual dissonance. In order to solve these items most efficiently, the logical structure of the item premises must have been attended to and not the meanings of the premises. In other words, the syntactic features and not the semantic features of each item must have been apperceived in order for correct resolution to occur.

Initially, a set of 60 items was prepared and pretested with the sample of subjects chosen for the study. Thirty items were chosen from the 60-item measure of formal thought upon an examination of the psychological properties of the items (i.e., moderate item difficulties in the .10-.90 range, high point-biserial correlations, and high first principal component factor loadings). Three formal reasoning tests were then constructed maintaining the formal structures of the 30 selected items. The tests with six-alternative multiple-choice items were set in the content areas of biology, history, and literature respectively. The 30-item logical structures and their order were maintained in each of the three sets.[2]

The interest inventory was administered to the three separate groups before the 60-item reasoning tests during their respective pretest group-testing sessions. The subjects were given directions for taking the test and told to be honest and frank in their responses. Though there was no time limit on the interest inventory, all subjects completed the test in less than 30 minutes.

The 60-item reasoning test was a power test with no time limit and was completed in less than 90 minutes in group-testing sessions after the interest inventory was completed. The students were given instructions for each reasoning test and told to perform as well as possible. The three 30-item formal reasoning tests were administered to each of three subsamples of subjects in group-testing sessions one month after the pretesting in the following order—biology, history, and then literature. The three reasoning tests were powei tests with no time limits; however, every subject completed each test in less than 40 minutes.

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[2] Details of these tests including validity information may be obtained from the author.

C. RESULTS

To test the hypothesis relating interest and formal reasoning, a procedure involving the Goodman-Kruskal γ statistic, which is a measure of association between two ordinal categorizations, was used. If γ is near 1, then a positive association between the variables is indicated. If γ is near —1, then a negative association (counterassociation) between the variables is indicated. If γ is near 0, then no association (independence) between the variables is indicated (4, 5).

Contingency tables relating level of interest score for each age level were constructed (see Tables 1-3). If the measures of association between degree of interest and level of formal reasoning decrease with increasing age level, then the hypothesis is confirmed.

Tables 1-3 show that the measures of association relating level of interest to level of formal reasoning decrease with successively older age groups. Though this finding tends to support the interest hypothesis, it must be noted that it may be suspect to infer a trend among computed γ statistics that are not significantly different from 0 (indicating no association) at .05 level.

TABLE 1
CONTINGENCY TABLE RELATING LEVEL OF FORMAL REASONING SCORE TO CORRESPONDING LEVEL OF INTEREST SCORE FOR 13-YEAR-OLD GROUP

Formal reasoning scores	Interest scores High	Interest scores Middle	Interest scores Low	Totals
High	11.33	10.83	7.83	30
Middle	7.83	11.08	11.08	30
Low	10.83	8.08	11.08	30
Totals	30	30	30	90

Note: Computed $\gamma = .09$, not significant at .05 level.

TABLE 2
CONTINGENCY TABLE RELATING LEVEL OF FORMAL REASONING SCORE TO CORRESPONDING LEVEL OF INTEREST SCORE FOR 16-YEAR-OLD GROUP

Formal reasoning scores	Interest scores High	Interest scores Middle	Interest scores Low	Totals
High	10.00	8.50	11.50	30
Middle	10.00	12.50	7.50	30
Low	10.00	9.00	11.00	30
Totals	30	30	30	90

Note: Computed $\gamma = —.01$, not significant at .05 level.

TABLE 3

CONTINGENCY TABLE RELATING LEVEL OF FORMAL REASONING SCORE TO CORRESPONDING LEVEL OF INTEREST SCORE FOR 19-YEAR-OLD GROUP

Formal reasoning scores	Interest scores			
	High	Middle	Low	Totals
High	8.50	11.00	10.50	30
Midle	9.00	7.50	13.50	30
Low	12.50	11.50	6.00	30
Totals	30	30	30	90

Note: Computed $\gamma = -.18$, not significant at .05 level.

For a more exacting examination of this hypothesis, the computed γ statistics noting the relation between level of formal reasoning and level of interest for each of the three age groups and for each of the three content areas and for all content areas were calculated. (See Table 4, the last column of which gives the computed γ statistics cited in Tables 1-3.)

Though none of the relations was hypothesized to be negative, there are five negative, but nonsignificant, associations between level of formal reasoning and level of interest indicated in Table 4. However, the prominent feature of Table 4 is that only one of the 12 computed γ statistics is significantly related to level of formal reasoning throughout the stage of formal operations, indicating that the interest hypothesis is not supported. In general, the results of the methods used to test the interest hypothesis disaffirm this hypothesis.

In conjunction with the γ statistic results, it is relevant to examine the means and standard deviations for the three age groups and for the three tests. This standard statistical information is presented in Table 5.

From an examination of Table 5, one can see that the formal thought test means increase from the 13-year age level to the 16-year age level, but then level off and indicate no significant increase from the 16-year age level to the 19-year age level. This finding lends credence to the observation that formal reasoning becomes well established in a relatively short period of time after its emergence (6).

TABLE 4

COMPUTED γ STATISTICS NOTING RELATION BETWEEN LEVEL OF FORMAL REASONING SCORE AND LEVEL OF INTEREST SCORE FOR EACH OF THREE AGE GROUPS AND FOR EACH OF THREE CONTENT AREAS AND ALL CONTENT AREAS

Age groups	Biology	History	Literature	All content areas
13	.32	.09	.09	.09
16	.08	.35*	—.18	—.01
19	—.05	—.23	.17	—.18

* Significant at .05 level.

TABLE 5
STATISTICS OF FOUR COGNITIVE TEST SCORES OVER THREE AGE LEVELS

Age level	Statistic	Biology formal thought test score	History formal thought test score	Literature formal thought test score	Mean formal operational reasoning score
13	mean	17.37	18.47	15.00	16.94
	sd	3.63	2.66	4.96	3.06
16	mean	20.20	18.37	19.73	19.44
	sd	3.33	3.65	3.69	3.07
19	mean	19.93	18.67	19.77	19.46
	sd	4.02	3.33	3.71	3.17
Total sample	mean	19.17	18.50	18.17	18.61
	sd	3.85	3.21	4.69	3.29

From an examination of Table 5, one can also recognize certain patterns that indicate that knowledge of a content area is related to formal reasoning in the content area. Thirteen-year-old adolescents received on the average higher formal reasoning test scores with respect to content areas in which they had received instruction (biology and history) than with respect to the content area in which they had not received instruction (literature). On the other hand, the six mean formal reasoning scores for the three tests for the two older groups were of the same order (near 19.45), indicating considerable generalizability of formal operational skills at 16 and 19 years of age. It seems that adolescents will manifest formal reasoning at a similar level across content areas of which they have knowledge and at a lower level across content areas of which they do not have knowledge. This finding is in agreement with a similar finding of Stone (12) and lends credence to the hypothesis that knowledge of a content area is a necessary but not a sufficient condition for formal reasoning in the content area.

D. DISCUSSION

The results of the present study permit no definitive conclusions as to the identification of the salient factors determining *horizontal décalage* at the stage of formal operations. Evidence was provided that interest does not have a decreasing differential cognitive effect at the stage of formal operations and that the magnitude of the interest effect on formal reasoning is slight throughout the stage of formal operations. It is thus doubtful whether interest is a key factor in *horizontal décalage* at the stage of formal operations.

This finding agrees with the finding of Dienes and Jeeves (1) that the ability to induce and determine the group structures embedded in tasks, which in turn is akin to the ability considered by Piaget to be formal operational that is tested for in the Piagetian equilibrium tasks (e.g., balance task), is not related to level of interest in the tasks. Thus, further evidence is provided that interest is not a salient factor involved in the dynamics of *horizontal décalage* with respect to formal thought.

Possibly a more reasonable hypothesis relating to the dynamics of *horizontal décalage* at this stage is that of Lovell (7): Familiarity with and knowledge of a content area is a necessary condition for formal reasoning in the content area. From an examination of the means and standard deviations for the formal thought tests obtained as indicated in Table 5, evidence was cited that lent credence to the Lovell hypothesis. The hypothesis formulated by Lovell could in turn be modified to provide a hypothesis that is more compatible with Piagetian theory: Concrete reasoning in a content area (e.g., classification and seriation of terms and items in a content area) is a necessary but not a sufficient condition for formal reasoning in the content area. This hypothesis is a more definitive statement of the fundamental Piagetian contention that concrete operations are a necessary but not a sufficient condition for formal operations.

Studies directed at testing these alternative hypotheses would not only provide a more complete explanation of the dynamics involved in the development of formal reasoning, but would also provide educators with the basis from which to develop curricular procedures to effect systematically the generalizability of formal operational skills across content areas.

E. Summary

An interest test and three formal reasoning tests were administered to 90 scholastically above-average 13-, 16-, and 19-year-olds to determine each subject's degree of interest in biology, history, and literature and his level of formal reasoning in the same three areas. From Goodman-Kruskal γ statistical procedures it was determined that level of interest has little if no association with level of formal reasoning throughout the stage of formal operations, thus disaffirming the hypothesis that interest has a decreasing differential cognitive effect at the stage of formal operations. An alternative hypothesis that concrete reasoning in a content area must precede formal reasoning in that area was presented with confirming evidence.

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ALCOHOL DOSE EFFECTS ON FEEDBACK-MAINTAINED SIMPLE REACTION TIME*[1]

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A. INTRODUCTION

There is no shortage of studies relating simple reaction time (RT) to the effects of alcohol. A review of nearly a dozen works conducted prior to 1962 led Carpenter (2) to conclude that (*a*) RT impairment was not universally obtained and (*b*) design weaknesses vitiated the conclusions of several of the studies. The research since Carpenter's review appears to continue in support of both observations.

In summarizing the earlier work, Carpenter (2) concluded that simple RT is impaired even at low doses of alcohol (.40-.50 ml/kg). Such a conclusion, however, may be inappropriate, inasmuch as RT is not always impaired. Further, the definition of a "low dose" of alcohol may vary. If the equivalent alcohol contained in one highball is considered to be a low dose (approximately .30 ml/kg), then virtually none of the studies has presented an analysis of low dose alcohol effects on simple RT. Typically dose levels that have been used exceed this amount. Even a more complex task (choice RT) appears to be essentially unaffected by a dose of .20 ml/kg (5).

There are additional problems beyond the paucity of studies dealing with low dose levels of alcohol. Carpenter (2) showed that many studies failed to specify the stimulus and/or the response. Also, these studies often ignored the confounding of practice effects with alcohol effects. It can be noted that previous studies have not always established a stable baseline of performance against which an alcohol effect may be evaluated. It is particularly uncommon to find that subjects are given instantaneous feedback regarding their performance on each trial. In other contexts, feedback has been shown to be of critical importance in maintaining performance or in acquisition of new skills (6). Finally, some of the studies reported relatively long RTs, suggesting that

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the "simple" task may have had complicating features. Each of these factors should receive consideration in exploring the effects of alcohol on RT.

The research described below evaluates the influence of alcohol on two different RT tasks, utilizing two sensory modes. The study aimed at describing effects of low doses of alcohol in a practiced group of subjects representing both sexes, all of whom received performance feedback following each RT trial.

B. METHOD

Subjects were 10 adult volunteers (ages 23-40), including four females (weights 52-64 kg) and six males (weights 76-89 kg). All subjects indicated previous contact with alcohol in social contexts.

The structure of the experiment imposed dose, task, and sensory mode manipulations as basic elements of the design. Within this framework the inclusion of both sexes allowed further comparisons.

All RT sessions were conducted in a dimly illuminated room into which the flash from a gas discharge tube (Grass PS-2) could be projected [see Sutton and Kimm (12) for details]. The experimental room contained a headset (Kits Model SH10K) and an electronic timer (Hewlett-Packard 5223L).

At the beginning of each session, the subject was seated in a comfortable chair facing the timer and the flash aperture. Headphones were worn only during those sessions when auditory clicks were the RT signals. The subject placed his left arm (nonpreferred in nine subjects) on an adjustable arm rest to the end of which was fixed a telegraph key. The key required 80 g of force to depress and hold in the "on" position. The subject was instructed to operate the key with the left forefinger.

A tape-recorded control program was prepared for automatic presentation of the RT trials. The program consisted of a series of 50 trigger pulses occurring intermittently at intervals ranging from 3-12 seconds. For the visual mode RT trials, the trigger pulses operated the photic stimulator to produce a flash. For the auditory mode RT trials, the pulses triggered a pulse generator (Tektronix 161) producing a 1-msec, 15-volt pulse output to the headphones. No warning stimuli preceded the click or flash RT signals.

The same block of 50 pulses was used throughout the sessions. In all, 16 repetitions of the series were completed. In any given session, four repetitions were completed—two involving flexion (key press) and two involving extension (key release). Every subject, therefore, completed four sessions, in each of which he performed four repetitions of the 50-pulse series.

Each trigger pulse also enabled the timing circuit. Key press or key release action served to terminate the timing episode. Thus, flexion and extension movements of the wrist and fingers were studied throughout the experiment. At the end of each trial, the time that had elapsed from the stimulus until occurrence of the appropriate response was displayed on the timer. This procedure served to provide systematic feedback regarding performance throughout the session.

A practice period of 50-100 trials preceded each experimental session. This period enabled the subject to "warm up" and become stable in his responding. Each subject was instructed at the beginning of each session to respond as rapidly as possible to the RT signal.

Trial-by-trial RT values were recorded on a print-out counter for later analysis. Reaction time histograms, medians, and quartile values for each 50-trial series were obtained. Medians of each series were used in the statistical analysis.

Each subject performed each task (key press and key release) under three alcohol dose levels (zero cc, 50 cc, and 100 cc 80-proof vodka mixed in 8-ounce carbonated beverage). Fifty trials on one task were presented, followed by a one-minute rest period. An analogous series employing the remaining task was then completed. Selection of the initial task was determined in a quasi-random fashion, such that for half the subjects flexion trials preceded extension trials and *vice versa.* The entire process was carried out twice—once with the use of clicks and once with the use of flashes as RT signals.

For a given experimental session, RT performance under normal or control conditions preceded the alcohol treatment. Each subject performed under one of the two dose levels and one of the two stimulus modes in each of the experimental sessions. For example, one experimental session for a typical subject would have been as follows—visual (or auditory) mode (*a*) Series 1: Key press, normal; (*b*) Series 2: Key release, normal; (*c*) Series 3: Key release, 50 (or 100) cc dose level; (*d*) Series 4: Key press, 50 (or 100) cc dose level. Press and release series were always in ABBA sequence. The order in which alcohol doses were administered was balanced such that half the subjects received the smaller dose during the first and fourth sessions, while the other half received this same dose during the second and third sessions and *vice versa.* Thus, four experimental sessions, each consisting of four sets of 50 RT trials, were completed by each subject. At least 24 hours separated the RT studies made at different dose levels.

Ten minutes was allowed for ingestion, followed by a 20-minute absorption period. At the end of this interval (30 minutes after the normal or control run), RT performance was again evaluated. Six minutes were required to complete each 50-trial series.

The 50 cc vodka dose is equivalent to 20 cc absolute alcohol; the 100 cc vodka dose equals 40 cc absolute alcohol. On a volume/weight basis, these equivalent alcohol dose levels represent .31-.39 ml/kg and .62-.78 ml/kg respectively for the females, and .22-.28 ml/kg and .44-.58 ml/kg for the males.

C. Results

The preliminary practice period was found to be useful in assisting the subjects to adapt to the situation and to establish an efficient RT. During the practice period, the subjects were able to develop optimal response techniques, and thus reduced RT performance to a stable value prior to the beginning of the test series.

Stability in responding was observed in two ways: (*a*) session variability as represented by the interquartile range values and (*b*) test-retest performance under normal or control conditions.

Average interquartile ranges over the 50-trial sessions were 30.5 msec for RTs to visual stimulation and 36.2 msec for RTs to auditory stimuli. These figures demonstrate that responding was confined to a rather narrow temporal range. The two most consistent subjects had interquartile ranges of 13-15 msec, while the two least consistent subjects had 47-55 msec interquartile ranges.

Test-retest performance indicated a high degree of consistency. Typically, retest measures under normal conditions resulted in less than 15 msec difference between the medians of the two sessions. The reliability coefficient for these measures was .86 (Pearson r).

Subjects reported they were able to detect alcohol effects at both dose levels. Most felt that the larger dose was sufficient to impair complex judgments. Several reported that an increased effort was necessary in order to maintain attention.

A summary of the statistical analysis of the data is provided in Table 1. The results indicate that the mode of presentation of the RT signals (auditory or visual) is important in determining RT performance.

Each subject was able to generate significantly briefer median RTs when responding to auditory clicks than to the visual flash [165 *vs.* 186 msec, $F(1, 9) = 46.81, p < .001$].

Alcohol intake was also found to be a strong factor influencing RT performance. The statistical analysis revealed that the alcohol effect was highly

TABLE 1
ANALYSIS OF VARIANCE OF MEDIAN REACTION TIME VALUES

Source	*df*	*MS*	*F*
Mode (A)	1	15940.1	46.81***
Task (B)	1	770.1	1.58
Dose (C)	3	5526.7	11.41***
Subjects (S)	9	10568.3	
A × B	1	660.1	3.73
A × C	3	18.0	0.17
A × S	9	340.5	
B × C	3	162.5	1.38
B × S	9	487.8	
C × S	27	484.4	
A × B × C	3	142.2	2.47
A × B × S	9	172.2	
B × C × S	27	117.9	
A × C × S	27	106.2	
A × B × C × S (Error)	27	57.5	

*** $p < .001$.

significant ($p < .001$). Additional specific comparisons were made upon the alcohol data. The difference between control level scores and those of the lower alcohol dose (20 cc equivalent alcohol) proved to be not significant ($t = 1.83$; $p > .05$), whereas the comparison of control level scores with those obtained following 40 cc alcohol equivalent showed a significant difference ($t = 3.74$; $p < .001$).

Possible interaction factors were also examined in this study. It can be seen from Table 1 that interactions were relatively unimportant features. That is to say, there was no clear indication that the different dose levels influenced RT performance uniquely depending on the response task, nor did they differentially affect performance under the two sensory modes.

Figure 1 indicates the relationship between alcohol dose level and RT performance. The figure shows that performance deteriorated with increasing levels of alcohol, regardless of the specific motor task. The figure also indicates that the two tasks studied here had similar RT characteristics. A slightly superior performance on key press under normal conditions was not significantly shorter than key release. The trends for the two tasks suggest that key release may be somewhat less sensitive to alcohol.

Figure 1 further shows a definite dose-effect relationship for the amounts of alcohol used here. Further analysis of the data, however, suggests this "obvious" effect is not a general case.

Figure 2 presents another view of the data in this study, showing an analysis of the RT performances separately by sex. The figure also separates RT values

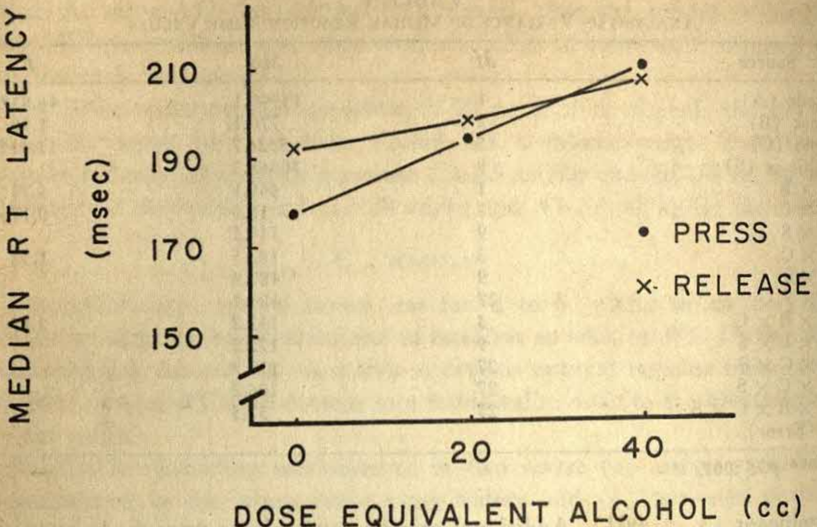

FIGURE 1
Alcohol Dose Effects on RT Latency of Key Press and Key Release

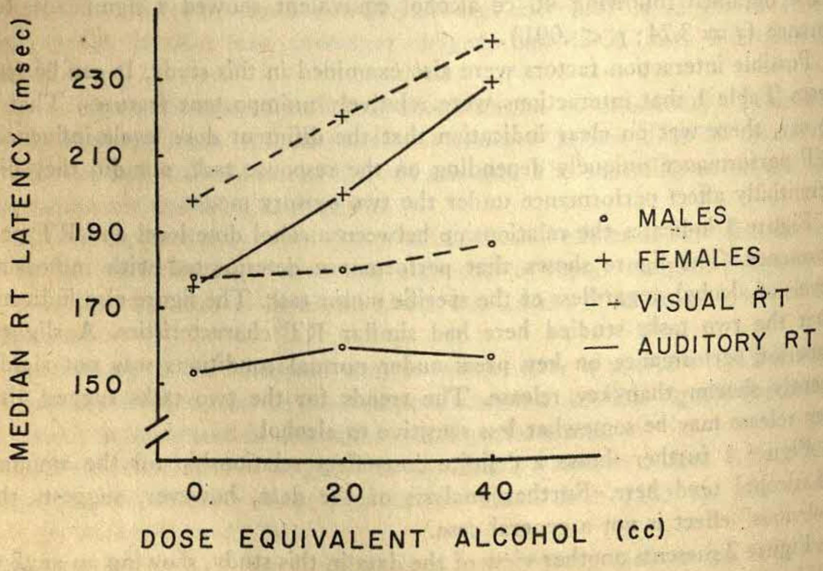

FIGURE 2
Differential Effects of Alcohol on RT Performance by Males and Females

obtained from the two sensory modes. It can be seen that alcohol produced more impairment among females than among males ($p < .005$, Mann-Whitney *U*-test). In fact, males were relatively unaffected by the alcohol treatments.

It should be noted that after the weight differences were adjusted between the two sexes, the higher alcohol dose for males (40 cc or .44-.58 ml/kg equivalent alcohol) clearly had less effect on RT than did a lower dose for females (20 cc or .31-.39 ml/kg equivalent alcohol). This was a statistically significant difference ($p < .01$, Mann-Whitney *U*-test). Even with approximately 50% greater dosage of alcohol, there was no significant impairment of RT responding by males.

Figure 2 shows that males had briefer RTs than did females. The males exhibited relatively brief RTs particularly when responding to auditory stimuli. The grand median for males working in this mode was approximately 150 msec.

Both sexes responded in a similar way to the stimuli used as RT signals. That is, auditory stimuli consistently produced briefer RTs than did visual stimuli. Further, the alcohol intake had essentially identical effects on RT to the two modes.

D. Discussion

Previous work has already demonstrated an alcohol effect on RT (1, 8, 13). Contradictory reports, however, indicate that impairment of RT by alcohol is not an obligatory relationship (4, 7, 10). It is true in some cases that the definition of a simple RT is questionable (e.g., failures in a driving simulator can hardly be construed as simple RT). In other cases, however, there is good evidence that simple RT (e.g., key press) performance is maintained.

Although some of our subjects (females) showed an impairment following alcohol intake in low doses, it is clear that the effect did not extend to others (males). There is no reason to believe that gross systemic changes are induced by alcohol. Neural transmission is unimpaired by moderate alcohol concentrations (3, 11). The higher dose level for males produced greater blood alcohol levels (BALs) than were required to alter performance by females. BALs for female subjects were computed to be near .03% and .06%, respectively, for the lesser and the greater alcohol doses. For males, BALs were near .02% and .04% for the two dose levels. Both values are low, but the higher doses are in the range employed by other studies, some of which have detected alcohol effects.

It might be argued that males have something akin to a "threshold" for alcohol effects which might not be reached by this particular study. However, since this study differs from other studies in no essential way with regard to the task (flexion-extension) or to the sensory mode employed (visual-auditory), this possibility seems unlikely.

Perhaps the most important factor relating to the performance by subjects in this study is the feedback provision following each trial. Each subject observed a display of the results of his preceding RT performance. The purpose of the feedback was to maintain performance and facilitate responding. All but one of the subjects had normal RTs less than 200 msec. These RTs are very brief in comparison with results of other studies. Since no other feature of the situation was markedly different from the usual RT study, it must be concluded that visual feedback of information serves to enhance performance. This effect may be developed through optimized vigilance. It has been reported that alcohol intake depresses vigilance (9). Vigilance failure may be responsible for RT decrement in many studies. With feedback given following each trial, there was an optimal vigilance situation.

Clues to the differential performance by males and females in this study were found in the subjects' reaction to and usage of the visual feedback. The male subjects were virtually unanimous in pointing out that the situation offered an excellent opportunity for self-competition on each trial. Thus, they adopted a strategy in which they attempted to improve each RT value over the preceding value. With the exercise of this strategy they were able to overcome any depressant effect of alcohol. The trial-by-trial situation clearly focused upon the feedback and, in effect, established brief episodes during which vigilance was maintained at a high level.

Females failed to adopt a competitive strategy in any systematic fashion. Postexperiment comments by females indicated that they were more concerned with making a proper response to the light flash; this reaction represents a "sensory" orientation to the RT situation. One of the classical observations in RT research has been that such a set serves to increase average RT (14). This sensory orientation also seems to explain the tendency for females in normal conditions to have slower RTs. Adopting a sensory set also seems to preclude optimum use of feedback, and it is reasonable to assume that females did not effectively incorporate this factor into their performance.

E. SUMMARY

Two dose levels of alcohol were given to 10 subjects performing finger extension and finger flexion in a reaction time (RT) paradigm. In all cases, trial-by-trial display of RT was provided. Two stimulus modes—visual and auditory—were investigated. RTs were briefer to auditory than to visual stimuli. Flexion and extension responses were approximately equal in RT latency. Alcohol impaired females in their performance of each response but did not affect males significantly. Apparent differences in attitude toward the trial-by-trial display account for the differential effect.

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POLITICAL AND RELIGIOUS BELIEFS OF CATHOLICS AND ATTITUDES TOWARD INVOLVEMENT IN THE VIETNAM WAR*

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A. INTRODUCTION

The suggestion that religious belief may influence political attitude is supported by several studies. Lenski (3) reports that active churchgoing Catholics tend to be Republicans more often than do marginal Catholics, perhaps because the Republican Party seems to offer a greater image of morality and integrity of public officials. Sappenfield (5) observes that Catholics tend to vote Democratic because of historical reasons although they may hold more conservative attitudes than do Protestants and Jews. With regard to private enterprise and economic security, Argyle (1) found that religious people more likely have conservative views than do nonreligious people. As an extension of these earlier works, the present study examined the association between response to the question of American justification for its present commitment in the Vietnam war and religious and political beliefs.

B. METHOD

1. *Subjects*

The sample consisted of 688 practicing Catholics from the state of Massachusetts. Only those individuals who volunteered to be interviewed and who were at least 18 years of age were considered eligible for selection. *S*s were obtained during the Spring of 1968 from eight regions throughout the state and from the 10 largest Catholic colleges in the state. No clergymen or those associated with religious orders participated as *S*s in the study.

2. *Questionnaire*

The questionnaire consisted of 34 Likert-type items which offered a response choice ranging from "strongly agree" to "strongly disagree." Nine of these items were concerned with religious beliefs and practices, while nine others

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pertained to political opinion. The one item involving Vietnam stated "America is wasting too many lives and too much money in Vietnam." All of the remaining statements were neutral with reference to these issues and pertained to personal habits. For convenience of analysis, the original responses by the *S*s were recorded into two categories, "for" or "against."

3. *Procedure*

The questionnaire was enclosed in a stamped, preaddressed envelope and was distributed to *S*s as they left Sunday church services. While making the announcements during mass, the priest read the following statement: "At the main exit of the church there is a box containing a questionnaire about many issues. This material is part of a statewide research project concerning opinion of Catholics. Anyone who wishes to is welcomed to take an envelope and express his opinions." For the college population, the questionnaire was distributed in a random fashion by school administrators and followed the same general instructions.

C. RESULTS

For the statement concerning Vietnam, no substantial differences in responses were found among the *S*s when they were classified according to age, education level, sex, or national origin of parents.

However Table 1 summarizes significant results for six of the Likert items. For the statement "Individual states should retain greater independence from Federal Government," 63% of those who favored the states' rights position supported, and 37% did not support involvement in Vietnam. On the other hand, for those who were not for states' rights, a relatively more even split occurred in their responses to the Vietnam question. With the use of a chi-square test of independence, the significant result (chi-square $= 8.15$, $df = 1$, $p < .01$) suggests that *S*s who responded in a conservative way with regard to states' rights more likely favored involvement in Vietnam than did *S*s who responded in a liberal way.

From Table 1 it may also be seen that a greater percentage of *S*s who supported involvement in Vietnam also reported that tax revenues should remain with local government (chi-square $= 10.68$, $df = 1$, $p < .001$) and that the United States should not form a common market with Europe (chi-square $= 3.85$, $df = 1$, $p < .05$). With regard to religious belief, those supporting Americans' commitment in Vietnam were less likely to suggest that the clergy should marry (chi-square $= 5.05$, $df = 1$, $p < .05$), and that contemplative religious orders, such as cloistered nuns, are no longer needed

TABLE 1
COMPARISON OF RESPONSE TO ISSUE OF INVOLVEMENT IN VIETNAM WITH RESPONSES TO OTHER STATEMENTS
(N = 688)

Statement	Response	Involvement in Vietnam % Support	 % Against	χ^2
Favors states' rights	For	63	37	8.15**
	Against	52	48	
Favor common market	For	55	45	3.85*
	Against	65	35	
Favors share taxes with the states	For	68	32	10.62***
	Against	54	46	
Supported relaxed fasting laws of church	For	56	44	3.00
	Against	63	37	
Contemplatives are needed for church	For	61	39	3.94*
	Against	53	47	
Clergy should be permitted to marry	For	53	47	5.05*
	Against	63	37	

* $p < .05$.
** $p < .01$.
*** $p < .001$.

(chi-square = 3.49, $df = 1$, $p < .05$). If one had hypothesized a one-tailed test (.05 level significance), then Catholics who did not favor the new fasting laws of the church would also have more likely supported the statement concerning Vietnam.

D. DISCUSSION

It would seem that advocating a states' rights position, not supporting the sharing of tax revenues, and being against the United States' joining a common market with Europe are opinions expected of political conservatives. Although it is not surprising that people of this persuasion would more likely support present American commitment in Vietnam than would political liberals, there still appears to be some inconsistency between this *laissez faire* attitude with regard to domestic affairs and an interventionist position for the war. From Dissonance Theory, some mechanism is necessary to tolerate such a discrepancy. Perhaps this could explain to some extent the popularity of the Domino theory as a justification for official American policy.

Although Lenski (3) reports that those who adhere to doctrinal orthodoxy in their religion manifest no particular tendency with regard to secular issues, the present results do not support this claim. With regard to the questionnaire statements dealing with religious issues, those *S*s who adhered to a traditional view of their faith also more likely supported involvement in Vietnam than did *S*s who approved changes in Church laws. Perhaps the early religious training inculcated by parents and clergy may have shaped a tendency to accept statements from those in authority. Since, up to the time when the present data were collected, neither the Church hierarchy nor even many parish priests had made important efforts to marshal opinion against the war, this silent if not overt acceptance of national policy may have served as an *imprimatur* for American policy for Catholics who were inclined to hold a restricted interpretation of their faith.

On the other hand the present results are consistent with the findings of King and Funkenstein (2) that religious conservatives and those whose fathers were strict disciplinarians tend to express their reaction to stress in an outward direction. Sanford (4) also observes that authoritarians are likely to act extrapunitively to frustrating conditions. Thus a possible response for political and religious conservatives to the frustration of the Vietnam issue might be not so much the positive support of American policy but a negative striking out against those who oppose the war.

E. SUMMARY

For a sample of 688 adult Catholics, significant associations were found between a Likert-type statement concerning support of American commitment in Vietnam and other political and religious beliefs. *S*s who favored involvement in Vietnam more likely felt a greater need for independence from government controls, reported that tax revenues should remain within local government, and rejected the suggestion of forming a common market with Europe. With regard to religious beliefs, supporters of official American policy less likely felt that clergy should marry, that fasting laws of the church should be relaxed, or that contemplative religious orders are no longer needed. It appears that acceptance of religious orthodoxy is related to conservative political views.

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ALLELOMIMETIC BEHAVIOR SYSTEM: DISTRESS VOCALIZATION AND SOCIAL FACILITATION OF FEEDING IN TELOMIAN DOGS*[1]

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A. INTRODUCTION

1. *Specific Objectives*

The specific goals of this experiment were (*a*) to find out if *social facilitation of eating* occurs in the relatively genetically uniform Telomian breed, (*b*) to find out if *social isolation* increases distress vocalization for the Telomian, (*c*) to find out if *unfamiliar surroundings* increase distress vocalization, and (*d*) to examine the effect of feeding on distress vocalization rates in the Telomian.

The Telomian is a breed of dog recently brought to this country from isolated villages in the rain forest area of the Malayan Peninsula. Behavioral data on the Telomian are just beginning to accumulate in this laboratory. What makes the Telomian particularly interesting as an experimental subject is its long genetic separation from other breeds.

2. *Relevant Research Areas*

a. Social facilitation of eating in dogs. A number of studies with a variety of crossbreeds have shown a differential rate of food consumption between dogs eating in groups and dogs eating alone. Results have shown that at least some individual dogs eat more when in groups than when eating alone. This phenomenon has been called social facilitation of eating (16).

In the first experiment on social facilitation of feeding in dogs, Ross and Ross (11) used two litters—four Chow-Basenji and six Terrier-Dachshund hybrid pups. Eight of the 10 pups ate more in the group than in the alone situation on the majority of trials, and the overall means for each litter showed greater food consumption in groups than alone. These differences were not tested statistically.

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Using the same six Terrier-Dachshund hybrids in a second experiment, Ross and Ross (12) demonstrated that food-satiated pups would resume eating each time hungry littermates were introduced one at a time into the test situation. This finding clearly shows that at least one factor in the differential consumption rate in groups and in isolation was the presence of familiar feeding animals.

In their first study the Rosses (11) suggested a number of factors that might account for their results. They expressed belief that a major factor was the previous experience of being reared in a litter. They considered the possibility that their results indicated an inhibition of feeding in the solitary condition. However, after the results were obtained on their second experiment, attention was shifted to the facilitating effects of group feeding and away from the possible inhibiting effects of solitary feeding on food consumption.

None of the subsequent experiments with dogs was done with any interest or discussion regarding the possibility that at least part of the differential amount of food consumption between group and solitary conditions was due to inhibition in the solitary condition.

For example, James and his colleagues (5, 6, 7, 8, 9) explored the roles of learning and dominance in social facilitation of eating. As well as confirming a differential rate of eating between single and grouped Beagle-Terrier hybrids and unspecified hound hybrids, they obtained support for the general notion that learning is important in the development of social facilitation. However, their interpretation of these results was limited to suggesting factors in the group situation that might account for increased food consumption. There were no clear-cut results regarding the relationship of dominance to social facilitation, but the thrust of the experiments was again in the direction of attempting to identify factors in the group situation that might increase food consumption rather than in the direction of looking at what might be happening in isolation to decrease food consumption.

Work with other species has provided indications that emotional distress is a possible factor in social facilitation of eating (20, 21, 22).

b. Distress vocalization in dogs. Later research with dogs has convincingly shown that isolation is an important stressor for dogs (2). Scott (15) has identified critical periods in dogs, times when dogs are maximally distressed (as measured by vocalization rates) by the absence of the familiar place (home pen) or the familiar face (littermates). He referred to these periods as *primary localization* and *primary socialization,* respectively. In the dog, the critical period for primary socialization begins at about three weeks and extends to approximately 12 weeks, with a peak between six-eight weeks. The process of primary localization covers approximately the same period.

Scott concluded that during this period the experience of the puppy momentarily wandering from or being separated from littermates and/or home pen with the concomitant negative emotional reaction (as inferred by distress vocalization), subsequently followed by the relief of this negative state (as inferred by cessation of distress vocalization) upon the puppy's return to the litter and/or home pen, is a natural conditioned learning paradigm repeated time and again in the normal course of development. Over time, this experience results in the animal's being strongly motivated to do what the other animals in the group are doing. Doing what the group is doing becomes the only way to avoid the negative emotional reaction that attends separation from familiar individuals and places. Doing what others are doing becomes an established behavior pattern, a reinforced habit.

Elliot and Scott (2) studied 32 purebred Beagle puppies, eight Cocker Spaniels, and five Terriers. The pups were isolated from other pups for 10-minute periods in their home pens and in a strange pen at weekly intervals from three to 12 weeks of age. The purpose was to assess the distress reactions in these situations as meaured by vocalization and activity. The puppies showed greater distress reactions when isolated in a strange pen than when isolated in the home pen.

Scott and Bronson (17) reported on an unpublished study by Causey (1), which showed three times more distress vocalization in the strange pen as compared to the home pen. In an earlier study Fredericson (3) had found that Beagle pups confined with another puppy vocalized significantly less than when alone or confined in a small box.

Scott and Bronson (17) reported a replication of Fredericson's experiment with a confirmation of his findings. The consistent finding was a 75 percent reduction in the vocalization rate when the puppy was placed with a companion.

Bronson (17) measured vocalization rates in six Beagles, all tested under six conditions. In each of three situations—together in home pen, isolated in home pen, and isolated in a strange cage—measures were made before and after feeding. With the prefeeding (hungry) rate of vocalization when together in home pen as the base, this rate increased by three and one-half times when the pups were in isolation in home pen, and increased by five times during prefeeding isolation in the strange cage. Interestingly, the rate of vocalization after feeding did not decrease significantly in the isolated conditions either in the home or strange pens, but it did decrease to only one-fifth of the prefeeding rate in the feeding together condition. While distress vocalization was decreased after feeding when pups were together in the home pen, isolation either in home pen or strange pen overcame this effect.

These differential rates also illustrate the emotional distress arising from both isolation and unfamiliar surroundings. The prefeeding rate when feeding together was just over 25/minute. The prefeeding rates in isolation were just under 90/minute in the home pen and 125/minute in the strange pen. These rates suggest that the distressing effects of social isolation and a strange pen may be additive.

3. *Development of Social Motivation*

Using the information available on the early development of puppies (18) and the information on distress vocalization, Scott (14) presented a theory of the development of social motivation. He classified social behavior into nine general categories of related behavior patterns. He called each of these categories behavioral systems—groups of behavior patterns having a common general function and organized in relation to one another.

He suggested that social facilitation of eating in dogs is a consequence of the development of the allelomimetic behavior system. Allelomimetic behavior involves animals' doing what other same-species animals nearby are doing with some degree of mutual stimulation: e.g., birds flocking, gerbils grooming, or human beings applauding (13).

Scott's proposed theory of social motivation relies heavily on the allelomimetic behavior system. As described above, the allelomimetic behavior system in dogs develops as a direct result of the experience of puppies during the critical period for primary localization and socialization.

From this view, social facilitation of eating in dogs is largely due to the allelomimetic behavioral system—individuals' tending to stimulate each other to perform similar acts. On the negative side, a dog in social isolation has no opportunity to engage in allelomimetic behavior. As a result the dog is in a strongly distressing emotional state (14). This negative state inhibits food consumption and should, at least in part, account for the different rates of food consumption when the dogs are in groups and when they are alone.

The following experiment varies the feeding situation on two dimensions: (*a*) eating alone or with littermates and (*b*) eating in the home pen or in a strange pen. The dependent variables are food consumption and distress vocalization.

It seems plausible to expect that the two measures should show an inverse relationship in the dog. Puppies should consume less food and vocalize more when feeding alone than when feeding with the litter; and puppies should consume less and vocalize more when feeding in a strange pen than when feeding in the home pen.

In order to test whether these variables bear a causal relationship to each other, we can compare performance in a strange pen with that in a home pen. According to previous results, vocalization should be increased in the strange pen. Food consumption in the strange pen should be either decreased, if affected by emotional distress, or remain the same, if not so affected.

To determine whether these predictions are valid for the Telomian breed is a major objective of this experiment.

B. METHOD

1. *Subjects*

Eleven Telomian pups, relatively genetically uniform, from three litters served as *S*s. They were 35 days of age at the beginning of testing. They were weaned four days prior to testing.

2. *Design*

Each pup was tested under all conditions; and all conditions were replicated four times. Conditions were counterbalanced to control for any linear sequential effects.

3. *Apparatus*

A stopwatch accurate to the second was used for timing test periods. A manual counter was used for counting distress vocalizations. A 2-inch × 12-inch × 18-inch aluminum pan was used for feeding. A bottomless wooden box which just fit over the feeding pan and had a lid which could be opened by mechanical means by *E* from *E*'s observation booth was employed by *E* for controlling eating during the test period.

Two pens were constructed for testing. They were 4 feet high, 6-foot × 8-foot rectangles constructed of ¾ inch plywood. One pen was the puppies' regular home pen in which they had lived since birth. The floor was covered with wood shavings. Except during testing, food and water were available *ad lib*. The second pen was similar but did not have wood shavings on the floor. The actual floor material was painted cement and was identical in both rooms. For observation a plywood wall was available which shielded a standing *E* from the dogs' view, but permitted observation of the puppies in the pen.

The food used in the experiment was mixed according to the following proportions: 500 grams of Rival canned dog food, one-half cup Gerber's baby cereal, and one and one-half cups of water. The appropriate portion of vitamins and bitch's milk were then added to this mixture.

4. *Procedure*

The major variables manipulated were (*a*) littermates feeding together *versus* littermates feeding alone and (*b*) feeding in the strange pen *versus* feeding in the home pen. The testing schedule used is presented in Table 1.

TABLE 1
DAILY TESTING SCHEDULE OVER THE FULL 16-DAY TEST PERIOD

Trials	Sequence of H & S conditions	Day	Sequence of T & A conditions 1st feeding	2nd feeding
1	H	1	A	T
	S	2	A	T
2	H	3	T	A
	S	4	T	A
3	H	5	A	T
	S	6	A	T
4	H	7	T	A
	S	8	T	A
5	S	9	T	A
	H	10	T	A
6	S	11	A	T
	H	12	A	T
7	S	13	T	A
	H	14	T	A
8	S	15	A	T
	H	16	A	T

Note: H = test in the home pen; S = test in the strange pen; T = test feeding together with littermates; A = test feeding alone without littermates.

First the dogs were removed to holding boxes in a separate room. The prepared food was then placed in the pen in which testing took place (home or strange pen). The bottomless box was then placed over the food pan, and the mechanism for raising and lowering the lid of the box was attached so that *E* could control the presentation of the food.

At this time, when the pups were first tested in the alone condition (as on the first scheduled testing day), a single pup was weighed and placed in the testing pen. The test period began as soon as *E* reached the observation point after having placed the pup in the pen. Each test period lasted six minutes: two minutes with the food covered, two minutes with the food uncovered, and two minutes with the food again covered. Vocalizations were counted and recorded for each two-minute period.

At the conclusion of the six minutes, the puppy was removed and weighed, and a measure of food consumption thereby obtained. Both feces and urine resulting from elimination during the trial were collected with absorbent paper and taken into account in determining the food consumption. This procedure was followed for each puppy within a given litter. This procedure resulted in some bias against the experimental hypothesis, since some small amount of urine in the home pen was lost in the floor materials. Since the weight of the lost urine would have been added to the amount consumed, then the error involved a lower estimate of food consumed in the home pen. The actual amount involved was minute, and did not affect the direction of the obtained results, though the chances of obtaining the expected differences between home and strange pen were reduced.

After each puppy of a litter was tested under the feeding alone condition, all puppies of a litter were then tested under the feeding together condition. The procedure was the same; all puppies were again weighed both before and after the together condition.

Since in the alone feeding condition each dog was fed at a different time, one could expect that the dog fed last would be hungriest and would eat the most. To diminish one effect of this variable over the experiment, the investigators varied the order of feeding systematically over the two-day segments of the experiment. When the testing sequence was reversed so that the feeding together condition preceeded the feeding alone condition (as on the third scheduled testing day), the procedure itself remained identical.

C. RESULTS

In the data analysis, scores obtained in the first and second feedings were analyzed separately. Unless specified, all tests described below were carried out for both first and second feedings.

1. With the use of a randomized blocks design (10), 2 × 2 analyses of variance were calculated to test for the occurrence of differential rates of food consumption between dogs eating alone and in groups (factor A—social environment) and between dogs in the home pen and dogs in the strange pen (factor B—physical environment). For each pup the scores were the sum of the amount of food consumption measured in grams across trials within each of the four experimental conditions: alone-home pen, together-home pen, alone-strange pen, together-strange pen, Omega squares were calculated to estimate the strength of the relationships (4).

The analyses of variance on the food consumption variable yielded highly significant F ratios: 1st feeding, $F = 82.4$ ($p < .001$); 2nd feeding, $F = 90.4$

($p < .001$) for factor A—the social environment. Other effects were not significant. These results were consistent across first and second feedings. The omega square indicated a moderately strong relationship: 1st feeding, $\omega^2 = .40$; 2nd feeding, $\omega^2 = .55$. Social facilitation of eating is thus established as a phenomenon occurring in Telomian dogs. In total consumption the 11 Telomians consumed 2.4 times as much food when together as when alone.

In the analyses of variance for factor B (home pen-strange pen) food consumption was not significantly affected. In consideration of the possibility that the dogs may have adapted to the strange pen with repeated exposures, the same analyses of variance were repeated, but only with the data of the first feeding over the first four days. Each dog's score was again the sum within the four conditions, but only over the first four trials. This procedure produced the same results as the analyses over all trials; however, the F value for factor B (home pen-strange pen) approached a .05 level of significance ($p < .1$), $F = 4.0$. An omega square yielded a .04 value which presents the possibility that the manipulation represented by factor B had a small measurable effect but one that was not substained over the duration of the experiment.

2. To test for differential rates of distress vocalization between dogs alone and in groups (factor A) and to test for differential rates of distress vocalization between home pen and strange pen (factor B), the investigators again used a randomized blocks design, and calculated 2 × 2 analyses of variance. The scores for each pup were the sums of distress vocalization across trials within each of the four experimental conditions: alone-home pen, together-home pen, alone-strange pen, together-strange pen.

These analyses were carried out for two measures of distress vocalization: (*a*) vocalization during two minutes prior to feeding and (*b*) vocalization during two minutes after feeding. Omega squares were again computed.

Both (*a*) prefeeding and (*b*) postfeeding distress vocalization showed a significant effect for factor A—social together condition: (*a*) prefeeding—first feeding, $F = 71.2$ ($p < .001$); second feeding, $F = 14.08$ ($p < .001$); (*b*) postfeeding—first feeding, $F = 85.1$ ($p < .001$); second feeding, $F = 25.2$ ($p < .001$). The direction of the differences was as expected with significantly more vocalization occurring in the alone condition than in the together condition. The omega square estimates indicated that the relationship was moderately strong, as well as significant: (*a*) prefeeding—first feeding, $\omega^2 = .47$; second feeding, $\omega^2 = .21$; (*b*) postfeeding—first feeding, $\omega^2 = .59$; second feeding, $\omega^2 = .50$. These findings establish the stress value of social isolation for the Telomian.

Again factor B (home-strange pen), the physical environment manipulation, resulted in no significant overall effects.

Analyses of variance on just the first four days of the experiment could not be computed because of the high proportion of zero distress vocalization scores in the group feeding situation. Instead, for days one and two, the sums of prefeeding and postfeeding distress vocalization scores for the alone condition were used to compare vocalization in the home pen with vocalization in the strange pen. A *t* test for matched pairs was used to test for differences (4). This test indicated a significant difference ($p < .02$) between home and strange pen with more vocalization in the strange pen. An effect of the home-strange pen manipulation was indicated at the outset of the experiment for the distress vocalization, but as was the case for the food consumption the effect initially present did not persist over the course of the experiment.

3. The sum of the difference in pre- and postfeeding vocalization was taken across the feeding alone condition for each individual. With use of the resulting 11 differences a *t* test for matched pairs was calculated to test whether the difference between pre- and postvocalization was greater than zero. The vocalization scores in the group condition were not used because of the large proportion of zero scores both in pre- and postfeeding. It might be noted that in the together condition the mean rate of prefeeding vocalization was greater than the rate of postvocalization.

The overall differences in pre- and postvocalization alone measures were not significantly different for the first feeding of the day, agreeing with previous results by Scott and Bronson. However, prefeeding vocalization on the second feeding is significantly lower than the postfeeding rate, providing an interesting problem for future research.

4. This test compared results on each day without respect to first or second feeding. To demonstrate a measure of association between food consumption and distress vocalization, the gamma statistic was employed by means of Goodman and Kruskal's method (4). *S*s were ranked according to (*a*) number of days out of 16 on which *S* consumed more, less, or an equal amount in the together condition compared to the alone condition (Table 2), and (*b*) the number of days out of 16 on which *S* vocalized more, less, or an equal amount in the alone condition (Table 3).

The Goodman-Kruskal gamma yielded a value of .71. This figure indicates a moderate degree of association between rankings based on frequency of days on which food consumption was greater in groups than alone, and rankings based on frequency of days on which distress vocalization was less in groups than alone. An inverse relationship is suggested between food consumption and emotional distress.

5. With use of the same ranking as in test 4 above, Spearman's rank order correlation coefficient (19) was computed. This computation yielded a significant $r = .72$ ($p < .02$) which is consistent with the results obtained with the gamma statistic.

TABLE 2

RANKING OF THE 11 *S*s ACCORDING TO FOOD CONSUMPTION BY DOGS OVER 16 DAYS

No. of Subjects	Rank	No. of Days Consumed More Together	No Difference	No. of Days Consumed More Alone
4 (*S*s 1, 4, 9, 11)	2.5	16***	0	0
1 (*S* 7)	5.0	15***	1	0
1 (*S* 5)	6.0	14***	1	1
2 (*S*s 6, 2)	7.5	14***	0	2
1 (*S* 3)	9.0	13**	0	3
1 (*S* 10)	10.0	12*	0	4
1 (*S* 8)	11.0	10	0	0

Note: $p < .05$ in 10 of 11 *S*s.
*** $p < .002$.
** $p < .01$.
* $p < .05$.

TABLE 3

RANKING OF THE 11 *S*s ACCORDING TO DISTRESS VOCALIZATION BY DOGS OVER 16 DAYS

No. of Subjects	Rank	No. of Days Rate of Distress Vocalization Greater in Groups	No Difference	No. of Days Rate of Distress Vocalization Greater in Isolation
3 (*S*s 4, 9, 11)	2.0	0	0	16***
1 (*S* 7)	4.0	0	1	15***
1 (*S* 6)	5.0	1	0	14***
2 (*S*s 2, 5)	6.5	2	1	13**
1 (*S* 10)	8.0	3	0	13**
2 (*S*s 1, 3)	9.5	2	3	11
1 (*S* 8)	11.0	5	2	11

Note: $p < .05$ in 8 of 11 *S*s.
*** $p < .002$.
** $p < .01$.

6. The data on food consumption shown in Table 2 were used to test whether social facilitation occurred for each individual animal. Since interest was in whether consumption was greater in the social condition, the No Difference and Consumed More Alone categories were combined into one. Then, by means of the binomial distribution the probability of the obtained results was calculated for each *S*.

Table 2 shows that all dogs ate more in the together condition on more days than they ate as much or more in the alone condition. Furthermore, the test for each individual indicated that the results of 10 of 11 *S*s were significantly different from what might be expected by chance. Under the conditions of the experiment, it can be concluded that social facilitation of eating did occur and was a pervasive phenomenon in the Telomian sample.

7. With use of the distress vocalization data in Table 3, the same procedure as in test 6 above was used to test for the stress value of isolation compared to the group condition for each *S*. In this case since interest was in whether vocalization was greater in the isolation condition, the No Difference and Days Rate of Distress Vocalization Greater in Groups categories were combined into one.

Table 3 shows that all 11 dogs vocalize more in the alone condition on more days than they vocalized as much or more in the together condition. Furthermore the binomial test for each individual indicated that the results of eight of 11 were significantly different from what might be expected by chance. Under the conditions of the experiment, emotional distress in response to isolation did occur and to some extent is general across individuals for the Telomian sample.

8. The means ($N = 11$) for food consumption and distress vocalization have been plotted over days to provide a graphic display of the clear-cut differences under the together and alone conditions (Figure 1).

D. Discussion

The results are in general agreement with the conclusions of past researchers regarding social facilitation of eating. Telomians as a breed eat at markedly different rates in groups and alone, the higher rate occurring in groups. The generality of the phenomenon is comparable to the results with the Terrier-Dachshunds obtained by the Rosses (11, 12) and to the results with hound hybrids obtained by James (6), since all 11 Telomians ate more in the group condition. Social facilitation and/or isolation inhibition of eating as a phenomenon is a more pervasive phenomenon in Telomians than in either the Chow-Basenji tested by Ross and Ross (11) or the Beagle-Terrier pups tested by James (5, 7, 8).

The failure to obtain differential rates of food consumption between home and strange pens was unexpected. However, such an effect was possibly present in initial trials. The expectation that negative emotional distress experienced in response to the strange environment would inhibit food consumption was predicted on the assumption that the *S*s would not habituate or adapt quickly to the strange pen.

The previous distress vocalization studies had tested animals weekly in strange and home pens (2). On this schedule pups maintained a high rate of distress vocalization over a period of weeks. It is possible that the more frequent exposure to the strange pen in the present experiment as compared with the previous experiments resulted in quicker adaptation to it by the Telomians than by the animals in the other studies. The rates for the first block of four days only are more similar to those of previous studies than are the rates for the remainder of the testing period.

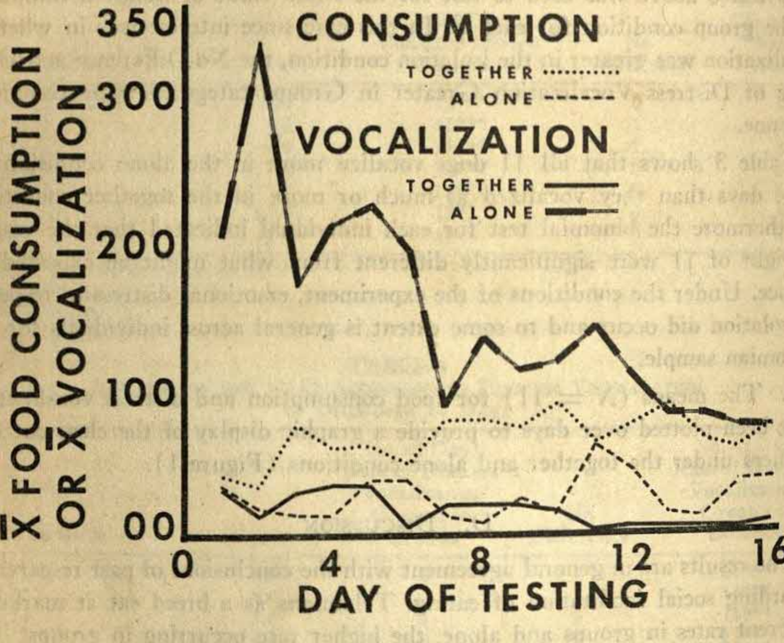

FIGURE 1
Mean Food Consumption and Mean Distress Vocalization When Alone and When Together For 11 Telomian Dogs over 16 Days
Vertical axis for food consumption is calibrated in grams, and for distress vocalization in discrete vocalizations.

It is also quite possible that Telomians differ from other breeds in the rate of adaptation to strange environments. Their rates of distress vocalization were generally lower than those obtained in other experiments. They may be more resistant to stress than breeds used in previous research. There is some indication that such is the case from unpublished data based on Telomians as *Ss* in studies of the kennel-dog syndrome (Scott, research in progress).

Another possibility is that the positive reinforcement provided by feeding in the strange pen over trials facilitated adaptation to the strangeness. A problem for future research would be to determine to what extent, if any, feeding assists in reducing emotional distress.

Another approach that might be taken by future research would be to provide a new and different strange environment for each trial. Another experiment of value would be to repeat a version of the present experiment but to test only once a week.

Regardless of how one compares the present results with past research, the relationships between the social environment and distress vocalization are much like previous results. Placement of dogs in social isolation elicits vocalization at a substantially higher rate than does placement in a social group.

One other notable comparison with previous research relates to the difference in pre- and postfeeding rates of vocalization. Scott and Bronson found essentially no differences in pre- and postfeeding vocalization in isolation and a decrease in postfeeding vocalization in the together condition. Their rates were based on a single measurement of vocalization in each condition. This finding is comparable to the results of the present experiment obtained in the first feeding over the first four days. No difference was found between pre- and postfeeding rates when alone in either home or strange pen. No test was made of the differences between pre- and postvocalization in the together condition because of the low frequency of any distress vocalizations, but the direction of the differences was the same as reported by Scott and Bronson. Vocalization was reduced after feeding.

In the alone condition, the differences in pre- and postfeeding vocalization rates for the second feeding reveal a rate of prefeeding vocalization that is markedly lower than the postfeeding rate of vocalization. This result indicates that a second experience on the same day (in this case following feeding together) gives a different result from a single feeding. No second feedings were given in the Scott and Bronson experiment. Full explanation of this phenomenon must await future research.

The data of this experiment provide evidence that a negative relationship between food consumption and emotional distress exists. The difference in vocalization rates when together with littermates and when alone needs no comment (see Figure 1). Though Ross and Ross (11) mentioned the possible importance of the inhibitory effect of isolation on food consumption, their suggestion has not been followed up. The present experiment suggests that attention again turn to this variable. The gamma statistic indicated a measurable relationship within the sample tested. Certainly there is evidence that *real* social facilitation occurs, as results of the second experiment by Ross and Ross (12) show. Nevertheless, emotional distress seems likely to be an inhibiting factor in food consumption in dogs and therefore a factor affecting results in experiments in social facilitation of eating. Full knowledge regarding this phenomenon will require a multifactor explanation. Further experiments in the area should be conducted with attention to a number of factors, including both social facilitation and isolation inhibition.

E. SUMMARY AND CONCLUSIONS

Food consumption and distress vocalization were measured for 11 five-week-old Telomians dogs twice daily for 16 days. All dogs were tested alone and together each day in the same pen. The kind of pen (home or strange) was alternated each day.

Highly significant ($p < .001$) differences for both food consumption and distress vocalization occurred between alone and together conditions. Telomians ate more when together than when alone and emitted more distress vocalizations when alone than when together.

No overall significant differences occurred between the home and strange pen conditions for either food consumption or distress vocalization although there were indications of effects on both consumption and vocalization at the outset of the experiment. The more frequent exposures to the strange pen in this experiment, as compared to the less frequent exposures in previous studies, and the presence of positive reinforcement in the form of food were suggested as factors in the rapid adaptation to the strange pen.

Although the rate of distress vocalization decreased over days in all conditions, in the alone condition the mean rates of distress vocalization before and after feeding on any given day were not significantly different. The occurrence of distress vocalization in the group condition was so limited that a meaningful statistical comparison was not possible, though the existing data (mainly for three pups) showed a marked decrease in the rate of postfeeding vocalization.

Although we were unable to demonstrate a clear-cut causal relationship between distress and food consumption, the existence of an inverse relationship between the two was strongly supported by the results of this experiment.

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EFFECT OF QUESTIONS ON VISUALIZED INSTRUCTION*

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A. INTRODUCTION

Questions are frequently used to focus *S* attention on important aspects of instruction. Previous research (3, 4) indicates that questions placed after content material are most effective. The purpose of this study was to measure the effectiveness with which different types of visual illustrations complementing textual material facilitated *S* achievement of different learning objectives, when questions designed to direct *S* attention to relevant learning cues followed each visual display.

B. SUBJECTS AND PROCEDURE

Each of 272 Psychology 2 *S*s at The Pennsylvania State University was randomly assigned to one of nine treatment groups. The treatment groups received instructions via a textbook format consisting of 37 paragraph-type frames on 8½-inch by 5½-inch sheets. Each frame contained a 2½-inch by 3½-inch plate designed to illustrate the verbal content. Each question was located on a separate page and each question page followed an instructional frame. The eight treatment groups receiving visualized instruction were the experimental treatment groups, and the treatment group containing no visuals was considered the control. Information presented via the verbal channel was held constant for each presentation, and the amount of realistic detail contained within the eight visual sequences was varied. Each *S* in each treatment group received a pretest, participated in his respective instructional presentation, recorded the amount of time needed to complete his instruction (which included a written response to each question), and then received five criterial tests designed to measure different educational objectives. The Kuder-Richardson Formula 20 reliability coefficients for the criterial measures were (*a*) drawing .86, (*b*) identification .81, (*c*) terminology .80, (*d*) comprehension .77, and (*e*) total criterial .94. Complete descriptions of the visual materials presented to the treatment groups (line drawings, shaded drawings,

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heart model, and photographs—all in both black and white and color), as well as of the objectives of each criterial test, have been recorded in previous research (1, 2).

C. RESULTS

An analysis of variance (ANOV) conducted on the pretest scores yielded insignificant differences on the time *S*s needed to complete their instruction. Only on the drawing test (via ANOV) was a significant F ratio found to exist ($F = 2.66$, $df = 8, 263$, $p < .01$). Tukey's W procedure (5) was used to analyze differences between pairs of means. The analysis indicated that the detailed, shaded drawing presentation in color was the most efficient treatment in facilitating *S* achievement on the drawing test ($W = 3.69$, $n/v = 9/272$, $p < .05$).

D. DISCUSSION

On the identification, terminology, comprehension, and total criterial tests, *S*s receiving the presentation without visuals achieved as well as did those receiving the visualized treatments. These results may be attributed to the fact that the questions effectively reinforced relevant learning cues. However, it may be that when *S*s answered the specific questions, they ceased to interact with the visualizations for additional information and, as a result, the visuals lacked effectiveness. The effectiveness of the drawing presentation may be explained in the following manner: the type of learning measured by the drawing test required visualization, and the color in this visual depicted vividly the information needed by the *S*s to achieve on the criterial measure.

E. SUMMARY

The results indicate that when questions follow textual material and focus *S* attention on relevant learning cues, visualization of the content material is not an effective instructional technique for facilitating *S* achievement of all types of learning objectives.

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DOMINANCE-SUBMISSION IN PROFOUNDLY RETARDED MALE SUBJECTS UNDER CONDITIONS OF STRONG MOTIVATION*

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A. INTRODUCTION

Vernon indicates "there are two exceedingly important classes of motivated behavior: avoidance of danger and its accompanying emotion of fear; and defensive or aggressive action, with the emotion of anger" (20, p. 17). When the focal group is profoundly mentally retarded (PMR), little is known of the behavior of its members under conditions of strong motivation. Since minimal communicative skill characterizes the universe of PMRs (8), experimental and therapeutic interventions must necessarily be nonverbal in nature. Identifying antecedent stimulations that consistently evoke nonverbal or verbal responses is one means of systematically enlarging our knowledge of PMR's motivational hierarchies (2). Bindra wrote, "activities which are most likely to occur in a state of heightened arousal are those which are prepotent in the animal's repertoire" (3, p. 160).

Behavioral modification studies employing electric shock or apomorphine have produced a variety of positive behavioral changes. In view of the strongly aversive nature of shock, however, the authors have undertaken a series of investigations to enlarge our bank of motivational stimuli, employing social arousal techniques without actual introduction of physical pain. For example, in a study exploring steady gaze as a mechanism of social arousal (2), PMRs were shown to be differentially sensitive to this form of stimulation, in contrast to the pessimism typically expressed in regard to their social sensitivity (1, 7). Subjects' responses fell into two distinct reponse classes (approach and avoidance), and *S*s demonstrated remarkable intrasubject consistency—all "approachers" approaching regardless of *E* or experimental condition and all "avoiders" avoiding regardless of *E* or condition. These findings suggest refinement in dormitory placement, in grouping for research purposes, and in possible resolution of a long-standing nemesis: i.e., differentiation of autistics from PMRs.

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Of secondary interest to the authors is the explication of the extent to which sociocultural influences are responsible for shaping PMR behavior. Inasmuch as half this rare group are early institutionalized *and* exhibit massive cognitive deficit, they are doubly shielded from sociocultural learnings. In MacAndrew and Edgerton's description, ". . . their interaction with one another is both minimal and peculiarly ahistorical. In at least certain respects . . . they are *less* human than some infra-human species . . . they stand on the threshold between man and not-man, and thus permit simultaneous inquiry into both the nature of man and the nature of culture-bearing animals" (12, p. 318).

Investigation of PMR's behavior along the dominance-submission dimension provides insight into the relative contribution of experience in determining their coping responses. Hunt proposes that "fear of strangers does not appear in chimpanzees—or in children . . . who have always been exposed to a large number of persons" (10, p. 7). Further, Hunt suggests, "Multiple mothering need not be seen as a traumatizing experience . . . but rather as an inoculation against social shyness and fear" (10, p. 8). The early and prolonged institutionalization of PMRs (18), as well as high turnover of attendants (6), assures PMR maturation under multiple-mothering conditions. Thus, Hunt's hypothesis predicts little anxiety or submission in response to strangers among institutionalized, multiple-mothered PMRs.

Conversely, the ethological position would suggest rather uniform presentation of submissive gestures by PMRs when they are approached by an aggressive stranger. Both Lorenz (11) and Tinbergen (19) posit an *instinctive* inhibition of aggression in man (9), and ". . . behavior patterns eliciting in members of the same species an inhibition against aggression are called submissive or appeasing attitudes . . ." (11, p. 125). In man, such hypothesized behaviors include handshaking, bowing, and gaze aversion (2, 17).

The present study simulates a stranger's aggressive approach towards adult PMRs to (*a*) assess the arousal potential of this nonverbal social stimulation and (*b*) determine from *S*s' responses whether submissive or dominant (aggressive) behaviors occur, thus providing a test of ethological and incongruity-dissonance hypotheses of motivated behavior.

B. METHOD

1. *Subjects*

The *S*s were 26 profoundly mentally retarded male residents of the Brown Schools[1] and the Austin (Texas) State School. The *CA*s ranged from 13.3 to

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[1] The authors express their appreciation to the Brown Schools for their cooperation in the conduct of this study.

50.9 years ($M = 25.8$). Most *S*s were untestable on standardized intelligence tests, but Vineland Social Maturity Quotients ranged from 1.0 to 22.0 ($M = 9.9$). All *S*s were ambulatory and manifested no visual or auditory defects.

2. *Procedure*

Three *E*s individually and surreptitiously entered the large dormitory dayroom in which *S*s were tested. The purpose of the unobtrusive entrance was to minimize effects of *E* presence on *S* arousal and attention. One *E* sat in a far corner of the room and, from this vantage point providing unobstructed visibility, observed and recorded *S*s' responses.

The other *E*s circled the perimeter of the dayroom in anticipation of their approach to *S*. Each *E* approached all *S*s in both an aggressive and a nonaggressive manner. The type of approach was counterbalanced, with 13 *S*s approached aggressively prior to the nonaggressive approach (A-N) and 13 *S*s approached nonaggressively before being approached aggressively (N-A).

An aggressive approach was operationally defined by *E*'s facing an attending *S*, stamping his feet in a threatening manner, and rapidly approaching to within six inches of *S* to insure invasion of his personal space (16). A nonaggressive approach involved *E*'s facing an attending *S*, smiling submissively, and approaching *S* in a nonthreatening, friendly manner, with right hand extended in a handshaking fashion. All approaches were initiated from a distance of approximately 15 feet.

On each effort to elicit the handshake, each *E* kept his hand outstretched for as long as *S* attended without departing, since extremely delayed responses are not infrequent in PMRs.

C. RESULTS

Three raters independently evaluated the observer's data records. There was complete agreement across all three raters on 70 responses. Final agreement, following discussion of remaining responses, produced a total of 75 responses to the simulated assaults of both *E*s, which were classified by all three raters as either submissive or dominant gestures. These results are summarized in Table 1.

Twenty-four of the total of 26 *S*s responded to aggression with behaviors that were clearly dominant or clearly submissive in nature. In the A-N condition, in which *S*s were approached aggressively prior to the nonaggressive approach, 11 of the 13 *S*s exhibited clearly submissive gestures to both *E*s, while the remaining two *S*s exhibited clearly dominant gestures to one or both of the *E*s. In the N-A condition, in which *S*s were approached nonaggressively

TABLE 1
FREQUENCY OF DOMINATING AND SUBMISSIVE GESTURES TO TWO EXAMINERS (E_1 AND E_2) UNDER AGGRESSIVE-NONAGGRESSIVE (A-N) AND NONAGGRESSIVE-AGGRESSIVE (N-A) CONDITIONS

Condition	Examiner	Number of gestures	
		Dominating	Submissive
A-N	E_1	1	24
	E_2	1	23
	Subtotal	2	47
N-A	E_1	0	13
	E_2	1	12
	Subtotal	1	25
	Total	3	72

prior to the aggressive approach, 10 of the 13 *S*s also exhibited clearly submissive gestures to both *E*s, one *S* exhibited clearly dominant gestures to one *E* (while merely "rocking" in front of the other *E*), and the remaining two *S*s merely "looked" at both *E*s.

Examples of submissive gestures were retreating, turning the head, backing up, shielding face, running, smiling, and cringing. Only five of the 22 *S*s exhibiting submissive gestures gave only one form and most gave three or more. A typical observation of submissive responses reads: "*S* smiled broadly, shielded his face, backed away immediately." The clearly dominant gestures included "standing their ground," staring, butting, and hitting *E*s. A typical observation of dominant gestures reads: "*S* stood ground, stared back at *E*, then butted head against *E*."

In a check of the generality of submissive and dominant gestures across different *E*s, it was found that 12 of the 13 *S*s in the A-N condition gave the same type of gestures to both *E*s, while in the N-A condition 11 of the 13 *S*s gave the same type of gestures to both *E*s. These data are strikingly consistent with the previously reported findings (2) of intrasubject consistency and thus provide further evidence of behavioral regularity at this lowest end of the intellectual continuum.

D. DISCUSSION

This study evidences the utility of arousal conditions in elucidating the existent behavior repertoire of the PMR. The elicitation of markedly consistent behavior patterns under arousal conditions supports approaches to behavior modification without pain and suggests a vehicle for therapeutic intervention with a population that is typically unresponsive to traditional psychometric techniques or psychiatric interviews (14).

Of particular relevance here was the serendipitous finding that installation of arousal via simulated threat served to elicit behavior learned at an earlier life stage. That is, speech was evoked from one *S* ($CA = 27; SQ = 9$) who was reported to be mute. In the A-N condition and on both "assaults" from both *E*s, this *S* distinctly said, "They won't hurt you, honey." This occurrence of speech appears explicable along associationistic lines: i.e., learned under conditions of intense arousal. One can speculate that this sentence was learned, for example, while receiving an inoculation—the comforting mother's words being associated with this earlier anxiety experience. In view of the credence attributed to mean sentence length as a measure of developmental level by psycholinguists (13), this five-morpheme utterance suggests a level of function well above the PMR diagnosis. Brown *et al.* (5) report a mean utterance length of five morphemes for a normal child of 49 months *CA*. Such delayed demonstration of prior learnings with the retarded was anticipated by Seguin (15, p. 110): "The chances are that what the child learns today, he will not show at once; but *occasion*[2] will bring it out later." The arousal methodology employed in this study appears to represent one such occasion.

As predicted, the results obtained in this investigation appear interpretable as a limited test of ethological *vs.* incongruity-dissonance hypotheses of motivated behavior. While the *S* sample is small, this study should be viewed in relation to the rarity of the total estimated (12) United States PMR population: i.e., 100,000. In view of the predominance of submissive behaviors shown by these *S*s, doubly shielded from sociocultural influences by virtue of massive cognitive deficit plus institutionalization, some evidence in support of the ethological position is suggested. As previously discussed, Hunt's hypothesis predicts manifestation of nonsubmissive behaviors in this institutionalized, multiple-mothered population. The clear plurality of submissive responses evinced by *E*'s approach, while necessarily interpreted with caution, does appear supportive of the ethological claim of an instinctive inhibition of aggression in man.

One unexpected finding was the occurrence of a disproportionately high incidence of left-handedness among the PMR *S*s. In the nonaggressive phases of both the A-N and N-A approaches, handshakes were obtained from 20 of the 26 *S*s. In the A-N approach, eight of the 13 *S*s extended their hands (five right, three left), while in the N-A approach, 12 of the 13 *S*s extended their hands (10 right, two left). This high incidence (25 percent proffering the left hand) suggests a need to attend more closely than has been done in the past to the variable of handedness in the design of facilities as well as in our efforts to provide social reinforcement to this population. Brown, in discussing perceptual style and stimulus seeking (4, p. 58), underscores the potential importance of handedness and indicates, "individuals who are 'left-handed,' for whatever reasons, generally receive less reinforcement, both explicit and implicit, in terms of their physical and psychological world, to use their 'dominant' hand, than do right handers." The evocation of the handshake in the present study, notably via "friendly approach," appears a useful technique for differentiating handedness among the profoundly retarded.

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[2] Italics supplied by the authors of this article.

E. SUMMARY

This paper reports the results of a simulated aggressive approach toward 26 profoundly mentally retarded adult males. The technique was demonstrated as capable of eliciting a consistent behavior repertoire from these typically unresponsive, lethargic, nonverbal *S*s. Analysis of *S*s' responses provided tentative support for the ethological as opposed to the incongruity-dissonance hypothesis of motivated behavior. The significance of this procedure, as an arousal methodology without pain, and two unexpected findings—the evocation of speech in a "mute" *S* and a disproportionate degree of left-handedness—are discussed.

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PSYCHOLOGY OF THE PAIN EXPERIENCE*[1]

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A. INTRODUCTION

Though every man can describe it, scientists have been unable to offer a successful definition of pain (2).

> The nature of pain has been the subject of bitter controversy since the turn of the century (34, p. 971).

Hardy, Wolff, and Goodell (20) suggested the term "pain experience" as a way of avoiding the confusion in measuring, defining, and investigating pain. Pain experience would include the individual's integration of all effects of noxious stimuli: (*a*) reactions to threat of pain; (*b*) reactions to noxious stimuli locally at the site of stimulation; (*c*) sensations of pain itself, with accompanying sensations—e.g., hot, cold, pressure; (*d*) reactions to the pain sensation.

Beecher (2) distinguished between the primary and secondary components of the pain experience. The primary component was the pain sensation itself; the secondary component involved the suffering, reactive aspects, and emotional responses to pain. In the same vein McGlashen, Evans, and Orne (32) pointed out that the subjective pain intensity did not necessarily reflect the level of stimulation, the extent of tissue damage, or the danger to the organism—notions that had been included in definitions of pain (2). Psychological factors—which include the meaning ascribed to the sensations, past experience, and anxiety—contribute importantly to the individual's response to pain. These psychological factors of the pain experience are the main considerations in this paper.

B. COGNITIVE ASPECTS OF PAIN

It is clear that previous experience influences the pain experience. Anticipation of pain and resulting anxiety are basic ingredients in the reaction component of the pain experience, whether the pain is pathological or experimental.

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Hall and Stride (19) demonstrated that subjects' attitudes influenced the amount of pain response. When the authors used the word "pain" in their instructions to the subjects of their experiment (in which a thermal stimulus was the source of pain), the subjects' anticipations were translated into greater sensitivity, or lower thresholds, for pain than those of similar subjects who had received the same thermal stimulus but with a neutral instructional set. Clark (12) confirmed these results with subjects who received electrical and mechanical pain stimuli, as well as thermal pain stimuli. Blitz and Dinnerstein (7) also demonstrated the analgesic potential of different types of instructions which encouraged reinterpretation of ambiguous experiences.

When anxiety about pain is reduced, the subjective experience of pain can be reduced. Jones, Bentler, and Petry (25) provided some of their subjects with information that reduced uncertainty about the timing or amount of pain to be endured. Electric shock was the pain stimulus administered to 32 college men. The subjects had in view an electric clock and were instructed that the shock would come only at the quadrants of the clock, at the numbers 3, 6, 9, and 12. They wore earphones through which they could receive messages and had a button by which they could signal for information about the timing of the next shock—whether or not it would occur in the next quadrant—and the amount of shock to be given. Amount of shock was randomized. The pain tolerance of each subject was determined before the experiment. A pain intensity scale was developed in which 5 was the maximum and intensity was scaled down in even steps to 1. Requests from the subjects for information increased whenever an interval passed in which no shock was given or when a shock of high intensity was anticipated. Answers to a questionnaire completed at the end of the experiment indicated that uncertainty concerning future pain elicited anxiety and information that reduced uncertainty reduced anxiety.

Hill, Kornetsky, Flanary, and Wikler (24) reduced anxiety by allowing their subjects to have control over the termination of the pain stimulus. Lepanto, Moroney, and Zenhausern (28) measured pain thresholds under conditions in which one phase allowed the subject to control the termination of pain stimulus and the other phase allowed the experimenter to control the termination of pain. Their data, like the results of Hill *et al.* (24), indicated that pain thresholds were significantly lower when the subject was deprived of control over the stimulus. Bandler, Madaras, and Bem (1) confirmed that the possibility of escape from a painful stimulus influenced subjects' interpretation of the painfulness of an electric shock stimulus. Ratings by the subjects of the amount of discomfort experienced during the escape and no escape trials clearly showed that discomfort ratings were lower in the escape conditions, when the subjects could push a button and turn off the pain stimulus. Galvanic skin response (GSR) was monitored on all the subjects: differences in GSR for escape and no escape conditions were not significant, and the subjects' ratings of discomfort were the exact reverse of the recorded GSR for the different experimental conditions. The subjects' ratings of discomfort were not related to internal cues after the manner of Valins' findings (48).

The subjects of Hill *et al.*'s study (24) were former drug addicts at the United States Public Health hospital in Lexington, Kentucky. The authors found that morphine diminished the pain reactions in their experiment if the anxiety level was high; but when the subjects were allowed to control the pain-producing stimulus, and anxiety was reduced, morphine had no demonstrable effect on the pain. Beecher (2) expressed the opinion that analgesic agents exerted their principal influence on the affective or reaction component of pain. Berger, Kletzkin, Ludwig, and Margolin (5) questioned whether any of the available analgesics could modify pain perception without at the same time altering the mood and consciousness of the individual. Dinnerstein and Lowenthal's subjects (15) were paid to perform a hand-steadiness task under threat of electric shock. The effects of aspirin on the pain connected with the electric shock were compared with placebos; not only did the aspirin lack analgesic effects, but it apparently potentiated the subjects' responses to anxiety.

Beecher (3) observed that most American soldiers who were wounded at Anzio either denied the existence of pain or experienced so little pain that they did not want any analgesic. When brought into combat hospitals, soldiers in only one out of three cases asked for morphine for their pain. When Beecher returned to clinical practice as an anesthesiologist, he asked civilians, who in major surgery had incisions similar to the wounds received by the soldiers, whether they wanted morphine to alleviate their pain. In contrast with the wounded soldiers, four out of five claimed that they were in severe pain and needed morphine. Apparently, no direct relationship between the wound *per se* and the pain experienced existed. Perhaps, the possibility of escape, which for the soldiers meant that they were alive and need not return to battle, reduced their interpretation of the pain experience.

Evans and McGlashan (17) measured pain tolerance by means of muscle ischemia. This method of inducing experimental pain, which Beecher (4) had used, consists of a blood pressure cuff inflated above systolic pressure which occludes blood flow to the arm and causes pain. The volunteer subjects of Evans and McGlashan were required to pump a rubber bulb which displaced water. The subjects gave a signal when the sensation in their arms turned to pain.

The rate of work, the amount of water displaced per second, was calculated to the point where the subjects first reported pain and again when the pain was so great that they could pump no longer. The subjects actually exerted more effort while they were experiencing pain than they did before the pain was first experienced. Interviews with the subjects indicated that they had expected the reverse to be true. As one explanation, the authors offered the possibility that the subjects pumped harder because of their increased anxiety about the increasing intensity of pain. As a second explanation, the authors thought the subjects might have pumped harder because they were trying to reach the end faster in order to be rid of the discomfort. Their results do support the common notion that pain experienced can be endured better by "bearing down" or "gritting one's teeth." Paradoxically, as the authors point out, pressing harder on the bulb to pump the water faster actually caused the pain to become more intense.

C. AFFECTIVE ASPECTS OF THE PAIN EXPERIENCE

So far it seems that the amount of pain experience need not be related to the amount of injury, and the relief of pain need not be related to the amount of analgesic agent administered. About 35 percent of over 1000 patients in 15 studies reported marked relief from pathological pain after receiving a placebo, an organically inactive substance (3). Pepper (41) remarked that his was the first article he could find on the subject of "placebos," despite centuries of use. A placebo was the term used for any medicine adopted more to please than to benefit the patient, but Pepper added that in former days, since physicians had no method of distinguishing the drugs that had true actions from those wholly inert, all medicines were considered powerful and none truly were. In incurable cases the placebo often postponed the use of sedatives or lessened the quantity that had to be given, thus helping to avoid the too quick exhaustion of opiate efficacy.

Where Pepper in 1946 had written about the placebo as a drug that had no pharmacological action but was given for its psychotherapeutic effect, Shapiro (44, p. 110) broadened the term to "placebo effect," which he spoke of as

> the psychological, physiological, or psychophysiological effect of any medication or procedure given with therapeutic intent, which is independent of or minimally related to the pharmacological effect of the medication or to the specific effects of the procedure and which operates through a psychological mechanism.

Shapiro believed that despite the scientific achievements of this century, the physician himself was the most important therapeutic agent. He recounted two episodes from 19th-century French medicine to illustrate his point: Dr. Raymond at Salpetriere in Paris treated patients by suspending them by their feet and letting the blood flow to their heads; and Dr. Haushalter at Nancy suspended patients head upwards. Both physicians obtained a similar percentage of success in treating a variety of organic and nervous diseases.

Krugman, Ross, and Lyerly (27) and Lyerly, Ross, Krugman, and Clyde (29) published studies in which they manipulated two drugs, one an energizer and the other a sedative, together with instructions to subjects that corresponded to the effects of either drug. Generally, the effects on the subjects followed the instructions given them, whether they received an energizer, sedative, or placebo.

Dinnerstein, Lowenthal, and Blitz (16) argued that placebo effects were based on the patient's comprehension of, and emotional response to, the apparent drug administration, and that both comprehension and emotional response depended largely on the instructions or suggestions given to the patient. The placebo effects thus resulted from the patient's knowledge that he had been treated plus his own interpretation of the nature of the treatment. Drugs usually are given with expressed or implied suggestions concerning some expected effect. The administration of an active drug includes many of the same variables that are involved in the placebo effect. Hence, active drugs are in part placebos, and the observed effects of drug administration are a combination of pharmacological and placebo effects. They argued that a consistent universal analgesic would require two properties: (*a*) it would produce a physiological effect that was independent of the initial physiological state of the subject, as well as of the effects of mood or expectancy; (*b*) the drug would produce a pattern of subcortical and cortical excitation and inhibition and a pattern of somesthetic stimuli that would allow only one "interpretation" by the subject. On the basis of present evidence no analgesic or tranquilizing drug had these universal qualities, and there was no certainty that highly specific drugs against pain and anxiety were even possible. If one wished to follow the action of present analgesics and tranquilizers, one would need to examine the interaction of the following factors: (*a*) The drug; (*b*) the permanent and transient physiological states and sensitivities of the subjects; (*c*) the context of treatment; (*d*) the implied and explicit suggestions accompanying drug administration; (*e*) the psychological history of the subject, which influences in turn —1) his response to the context; 2) his understanding of the suggestion; 3) his interpretation of the internal sensory changes induced by all of the variables above. Of these variables all but (*a*) and (*b*) are part of what is called the placebo effect.

Petrie (42) proposed that individuals could be ranked along a continuum from "reducers," who tended to minimize stimulus input, to "augmenters," who tended to exaggerate sensory input. Blindfolded subjects were asked to estimate the width of wooden blocks; Petrie's results suggested that "augmenters" tolerated pain least, while "reducers" accepted it best. Subjects who appeared to tolerate pain least manifested greater apprehension of pain.

Sternbach and Tursky (46) replicated research by Zborowski (52) in which he had found ethnic differences in response to pain stimuli. Zborowski had selected four groups who varied in responsivity to pain, as follows: (*a*) Yankee—assumed to have phlegmatic, matter-of-fact, doctor-helping viewpoint; (*b*) Jewish—concerned for implications of pain, distrust palliatives; (*c*) Italian—desire pain relief; (*d*) Irish—inhibit expression of suffering, concerned about implications of pain. Following the same assumptions, Sternbach and Tursky tested housewives who answered an ad in the newspapers—15 from each of the four ethnic groups. The women were paid for their participation in the investigation. Electric shock was administered through disks on the forearm. Each subject gave two signals: first, when she became aware of any sensation; and second, when the intensity increased to unbearable pain, at which point the stimulus was shut off. The lower threshold of sensitivity was similar for women in all four groups; the upper threshold, where the pain became unbearable, differed in accord with the hypothesized ethnic differences. Italians had the lowest threshold: that is, they were least able to take pain; Yankees were more matter of fact and adapted more quickly to the stimuli. Yankees and Irish both were undemonstrative but from different attitudes; Italians and Jews were more demonstrative toward pain but again for different reasons. Though the methods differed, the results of Sternbach and Tursky appear to complement the findings of Petrie.

A recent publication of the United States Department of Health, Education, and Welfare (47, p. 3) carried this statement: ". . . some people . . . are born without any sensitivity whatsoever to pain. . . ." Such individuals can be considered extreme instances of Petrie's "reducers." Sternbach (45) reviewed the literature on "congenital insensitivity to pain" and concluded that the 17 cases reported were markedly heterogeneous in symptoms and that no case was certain in the sense of having generalized insensitivity to pain and of reaching adolescence without ever experiencing pain.

Schneider (43) commented on Sternbach's conclusions that a distinction should be preserved among insensitivity to pain, the emotional aspects of pain, and the operations of defense mechanisms of indifference to pain. Waldman (49) discussed the exclusively psychological aspects of pain. Psychogenic pain need not follow the medical model of pain, which presupposes anatomic and physiological derangements which are involuntary happenings. The psychotherapist approaches psychogenic pain from the framework that pain is purposeful rather than biologically necessary and watches for consequences of pain rather than "causes."

Comparing relative pain perception of normal and psychoneurotic subjects was the purpose of Chapman's study (11). He used heat stimulation and measured (*a*) pain perception threshold, by which he meant the subjective endpoint of beginning pain, the lowest amount of pain necessary to cause a pricking sensation; and (*b*) pain reaction threshold, the first objective evidence of wincing or withdrawal from pain stimulation. Testing 200 normal subjects, he found ethnic differences; for Jewish and Italian subjects, who were two groups identified in his study, the results were similar to Sternbach and Tursky's findings. Psychoneurotic subjects (37) were compared to normal subjects similar in sex, age, and ethnic background. The pain perception thresholds were similar for normal and psychoneurotic subjects, but the psychoneurotic subjects showed greater sensitivity to pain in terms of the pain reaction threshold. The spread between the level at which pain was perceived and the level at which wincing and withdrawal occurred was significantly less for psychoneurotic subjects than for normal subjects. Reaction to pain appeared to decrease with age among his normal subjects when they were compared in three age groupings: 10-22 years, 23-44 years, and 45-85 years. The total number of normal subjects was 200, but no data were offered on the number in each of the age groupings. Other authors have disputed that there are differences in response to pain between normal and abnormal subjects (2).

Buss and Portnoy (8) found that strong identification with a group increased the tolerance for pain. War stories often have dramatized how men who endured danger together developed a strong and lasting bond. Buss and Portnoy administered electric shock through a finger electrode. After the pain tolerance of each subject was determined, subjects were given false norms of what comparison groups could endure in the experimental condition. The comparison groups were as follows: (*a*) Americans were told that Russians had a greater tolerance for pain; (*b*) college men were told that women could stand more pain than men; (*c*) college students were told 1) men from their rival college could stand more pain; 2) men from another college (not a rival but known to them) could stand more pain; (*d*) a control group was given no instructions.

The stronger the identification the more pain the subjects could stand beyond their established thresholds. The subjects who were given the false norms of "Russians" endured the largest amount of pain. Men to whom the false norms of women were cited withstood pain beyond their usual thresholds, but not as much as those who competed with "Russian" pain norms. College students who were put in competition with other collegians exceeded their ordinary pain thresholds: those who were told what men in a rival college could withstand endured slightly more than those to whom pain thresholds of collegians in a neighboring school were quoted. The control group, which had been given no instructions, endured the least amount of pain. According to the authors, one reason for the greater pain endurance of the subjects competing against the false norms of "Russians" was that the term "Russians" was clearly distinctive for all subjects. The second reason they offered was competition, which is a strong motivator. Such data help to explain the effects of initiation ceremonies for fraternal groups and of boot camp as used by the armed forces in building group identification.

Drs. Esdaile and Elliotson used hypnosis over 100 years ago, and the first attempts to perform surgery with hypnosis were made in France about 1821 (7). Inasmuch as hypnosis may reduce fear and apprehension, it can be valuable as an adjunct to sedatives: it may reduce tension aroused by the prospect of chemical anesthesia, and posthypnotic suggestions may minimize postoperative reactions.

Since about 20 percent of the population is not susceptible, hypnosis is not a substitute for anesthesia for all subjects (3). But chemical anesthesias may be contraindicated in some surgery—e.g., in cardiac cases where the extra burden on the circulatory system might be too great—and hypnosis might be an acceptable replacement for those who are hypnotizable. Sensitivity to pain remains, according to electromyographic studies, but in deep hypnosis the brain centers seem to ignore the messages of pain (30). Kroger and DeLee (26) described caesarian section and hysterectomy performed under hypnosis without any other sedatives or analgesics. Crasilneck *et al.* (13) employed hypnosis for painful burn surgery. They were particularly impressed with the success of hypnosis in counteracting the starvation cycle, which is so dangerous in burn cases. Under hypnosis doctors were able to stimulate not only appetite in general but also for those specific foods most needed by the patients.

Since the element of suggestion is operative both in anticipated pain and in hypnosis, the effects of hypnosis have been paralleled to the findings on placebos. McGlashan, Evans, and Orne (32) tested the hypothesis that hypnosis consisted of more than suggestion in its analgesic effects. Their 24 subjects were divided between those who were responsive to hypnosis and those essentially unhypnotizable. Ischemic muscle pain was the experimental pain stimulus. All subjects received a placebo, which was described to them as a drug that worked on the physical or cellular level. All subjects worked harder after they took the placebo, an activity that confirmed the results of the earlier study by Evans and McGlashan (17). No relationship between the placebo effect and susceptibility to hypnosis was evident; hence the authors concluded that susceptibility to hypnosis was not intrinsically correlated with placebo responsivity. Their results demonstrated that hypnotic analgesia added a potential for pain relief for susceptible subjects over and above that produced by the placebo effect. Two components appeared to be operative in hypnotic analgesia: (*a*) placebo effects of hypnosis as a method of treatment; (*b*) distortion of perception specifically induced during deep hypnosis.

Wolff, Krasnegor, and Farr (51) and Wolff and Harland (50) tested the effect on pain endurance of suggestion alone without hypnosis. They tested paid volunteers, men and women, using electric shock. After a series of trials in which the amount of shock was increased until the subjects had given the stop signal, indicating that they could stand no more, the authors invited their subjects to try once more and to imagine that they would receive $1000 if they endured the shock a little longer. They were told that they would not receive any money, but were asked to imagine that they would. The authors found slight increases in threshold and tolerance for pain on the last trial as compared with the previous trials.

Gardner, Licklider, and Weisz (18) reported that pain could be suppressed by sound. In about 5000 dental operations audioanalgesia, a procedure that combined music and noise, was effective in suppressing pain; for 65 percent of the patients, who had previously required local anesthesia or nitrous oxide in comparable operations, sound alone was effective in suppressing pain; for 25 percent of the patients the sound-induced analgesia was sufficiently effective so that no other analgesic or anesthetic agent was required; for 10 percent the audioanalgesia method was less than adequate. Other doctors used audioanalgesia for childbirth and minor operations. The patient wore headphones and had a control box which he could operate by hand. Before the operation and until the painful procedure began, the patient listened to stereo music. As soon as he anticipated pain or felt incipient pain, he turned up the intensity of noise. The doctor could judge the patient's state of anxiety by noting whether music or noise was turned on and at what intensity level. The patients reported that noise appeared to suppress pain and also masked the sound of dental drills, thereby reducing anxiety from another source. When both music and noise were turned on, the patients had to concentrate to follow the music. This introspective account of the patients seemed to say that the audioanalgesia method diverted attention from the pain.

Carlin, Ward, Gershon, and Ingraham (10) designed their investigation of the effects of auditory analgesia around the explanations of the patients. Three possible processes suggested themselves: (*a*) direct neural interaction by masking of pain impulses; (*b*) distraction (attention-attracting music and noise); (*c*) suggestion (involved in the perception of pain). The procedure used was electrical stimulation of the teeth of subjects who were patients, chosen at random, at a dental clinic. Three experimenters conducted the study; each was unaware of the experimental conditions in the other two stages. One knew which patients had the auditory analgesia; another knew the size of the electric shock; and the third knew which intensity of pain each patient had selected on a prearranged scale. The investigators obtained no evidence to support the masking, or cross-modality, explanation of the effectiveness of audioanalgesia in diminishing suprathreshold pain. Neither was there evidence that noise reduced sensitivity in the electrically stimulated tooth. There was only a hint that suggestion might raise the threshold slightly. One group of the patients had received an explanation of auditory analgesia in order to test the suggestion or placebo effect.

Though their negative results seemed to fit the placebo effect explanation of pain relief, the authors argued that the laboratory situation was artificial, as compared with the dentist's office. Also, they thought that since their subjects could focus on the tooth being tested, the influence of distraction might have been minimized. Also, the attitude of their subjects in the laboratory study might have differed from that of typical dental patients, inasmuch as the experimental subjects had limited pain, as contrasted with pain of uncertain duration and unknown severity in the actual dental condition. The effectiveness of auditory analgesia in the clinical setting of the dental office seemed likely to depend on a combination of suggestion and distraction.

In their experiments with auditory analgesia, Camp, Martin, and Chapman (9), who used radiant energy applied to the forearm, instead of painful stimulation of the teeth, found no significant differences in the intensity of pain experienced by their subjects, with and without music and noise. The authors also admitted that they had not included all aspects of the pain experience. Their stimulus probably restricted pain to the simplest sensory aspects and neglected the many aspects of threat and suffering involved in clinical pain. Similarly Marone (31) argued that audioanalgesia seemed not as effective in suppressing pain as initially demonstrated. He tested college men, with and without noise and music suppressors. Two weeks later he retested the same subjects and found significant changes in relief of pain through audioanalgesia. Repeated exposure to audioanalgesia seemed to lead to greater suppression of pain.

Beginning about 1935 brain operations, known as prefrontal lobotomies and lobectomies, were performed on severely disturbed patients as a method of last resort in hopes of making them more comfortable and tractable. These operations typically produced a state of indifference to pain, so that they were used sometimes in cases of intractable pain. The indifference to pain appeared to come about through a diminution of the prolonged disturbance that constant pain induced rather than through an absence of pain experience. Patients were still distressed by painful events and their pain threshold seemed to be lower than normal. But their pain experience did not make them feel as bad as before the operation, and they seemed less engrossed in their feelings and made fewer complaints about their situation (14).

Electrodes implanted in the brains of animals have provided the most recent source of information about pain. Miller (35) and Olds (39, 40) reported finding reward and punishment centers in the animal brain. Electrodes were implanted in the septal and hypothalamic brain areas; the electrodes ended in miniature sockets in the animal's head into which wires could be plugged. When provided with a lever by which it could administer a shock of electricity to a certain area of its brain through the electrodes, the animal acted as if it were rewarded, even choosing to press the lever in preference to food and drink. In other brain area implantations the animal acted as if punished and avoided the stimulation.

Electrodes have also been implanted in human brains (6). When electrodes were placed in the brain of patients suffering from Parkinson's disease, the patients smiled or grinned and asked for more brain stimulation. When the patients were given a button by which they could administer a shock to their own brains, they said that it "tickled" or "felt good" (36, p. 330). Patients who suffered intractable pain had brain implantations and were given a pain box, which allowed them to administer a shock to their brains. One device suppressed pain after about one hour of impulses (nine volts at a rate of 30 per second) with no irreversible damage to brain tissue (21). One advantage of the pain box was that it relieved the patient of the need for morphine-like drugs. One patient with cancer, who had required 100 milligrams of drugs every two hours, went along for three months without pain-relieving drugs once he began using the brain-stimulation device.

D. SUMMARY

Pain in its physiological aspects has been described well in recent articles by Melzack (33), Murray (38), and Hilgard (22). The term "pain experience" has been suggested as an alternative to "pain," because it includes the individual's integration of all the effects of noxious stimuli: for example, the reaction to threat of pain; sensations like heat, cold, and pressure, which accompany the sensation of pain; and psychological reactions to the pain sensation. Research on the psychological components of the pain experience has underscored the importance of cognitive and affective aspects of pain. Psychological factors, such as the meaning attributed to the pain, the age of subjects, and ethnic background, appear to contribute importantly to the individual's response to pain. Particularly relevant to the psychological aspects of pain is the use of hypnosis and audioanalgesia as anesthetics. The article reviewed studies of these "pain-killers" and investigations of the placebo effect in medical research. When psychological factors of pain are considered along with the physiological dimensions of pain, the subjective experience of pain becomes clearer, although not all the mystery of pain and suffering has been dispelled.

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PERCEPTIONS ACROSS THE LIFE SPAN OF IMPORTANT INFORMATIONAL SOURCES FOR CHILDREN AND ADOLESCENTS*

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A. INTRODUCTION

Many observers of the contemporary social scene (e.g., 4, 6) have commented that the family is rapidly diminishing in importance as a source of basic information for the developing individual. Assumedly other institutions or agents, such as the school and television, are taking over educational and socializing tasks that historically have been the prime responsibility of parents. It thus may be that young boys and girls no longer view their parents as important sources of knowledge. Their fundamental expectation, though perhaps not a conscious one, is that they will learn about the world and how to get along in it from persons and places other than the parents and the home. As McLuhan (5) has said, the level of information inside the family circle is much lower than that outside.

That parents are insignificant sources of information with regard to sexual matters has long been acknowledged and verified. Studies (e.g., 1, 2, 3, 7, 8) have consistently demonstrated that most young people receive their sex education from peers and from printed materials. Perhaps because parents are unable or unwilling to provide their offspring the needed information regarding the business of sex, it may be that in the eyes of their children they also lack credibility as reservoirs of knowledge in other critical areas. The dramatic changes in life styles in recent years in this society may contribute to these attitudes about parents as educators. Accordingly, the present investigation addressed these questions:

> Who is *perceived* to be the most important single agent in providing a child the basic kinds of information he will need to be a functional adult in this society? Is this same agent also perceived to be the most important informational source for the adolescent? Do persons of all ages agree on the relative importance of various informational sources for children and adolescents?

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B. METHOD

During the summer and fall of 1970 interviewers were stationed along the sidewalks of the business district of Madison, Wisconsin, in order to obtain data for the study.[1] The interviewer approached an individual and said the following: "Hello, I'm representing the Department of Educational Psychology at the University of Wisconsin, and I wonder if you would answer four quick questions? OK? I guess everybody agrees that we are living in difficult times. Children and adolescents have a great deal to learn if they are going to make it as happy and successful adults. (*a*) Who or what is the principal agent from whom the child—a school-age child—learns about the world and how to get along in it? That is, who is the most important transmitter of knowledge to children? (*b*) Who or what is the principal source of knowledge about how to get along in the world for the adolescent, or teenager? (*c*) Who or what are some other important agents in helping our children and youth to grow into happy and well-functioning adults? (*d*) And your age is _____? Thank you for your cooperation."

A total of 236 persons were interviewed. The breakdown of age groups was done in hopes that the data analysis would be sensitive to changing perceptions across the life span. Accordingly, seven groups resulted: 10-14 years (early adolescence), $n = 24$; 15-17 (late adolescence), $n = 31$; 18-25, $n = 35$; 26-30, $n = 49$; 31-40, $n = 28$; 41-50, $n = 36$; 51-75, $n = 33$.

C. RESULTS

Table 1 presents the nominations across age groups of the agent or institution perceived to be most important for children (only the first-named agent was recorded). Clearly, all age groups perceived parents to be most important for the individual at this time of life. A *chi*-square contingency test for parents *vs.* all other nominations across age groups was highly significant ($\chi^2 = 48.6$, $df = 6$, $p < .0001$).

Table 2 presents the nominations across age groups of the agent deemed most important for the adolescent. It is clear that other agents, particularly peers, were perceived as most significant at this time of life. However, parents were still nominated frequently by all age groups except the late adolescent/young adult groups. The contingency *chi*-square test for parents *vs.* other nominations was highly significant ($\chi^2 = 58.1$, $df = 6$, $p < .0001$), indicating that parents were far less frequently perceived to be important informational sources in comparison to other kinds of agents.

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TABLE 1
PERCEPTIONS ACROSS THE LIFE SPAN OF THE MOST IMPORTANT INFORMATIONAL TRANSMITTER FOR CHILDREN

Source	Percent nominated (first choice) Ages 10-14	Ages 15-17	Ages 18-25	Ages 26-30	Ages 31-40	Ages 41-50	Ages 51-75
Parents	75	37	46	68	61	69	49
Peers	17	33	17	16	14	3	12
School, teacher	4	13	11	2	14	22	18
Church	0	0	0	2	0	0	3
Media, TV	0	4	17	2	11	3	0
Other, no response	4	13	9	8	0	3	18

The third question allowed the interviewees to nominate other agents they thought to be of secondary yet still considerable importance. The responses to this question were generally confined to the school and/or teachers, various forms of mass media, and the church. The school was mentioned most frequently to this question by the 10-14, 26-30, and 31-40 age groups. The 15-17, 18-25, and 51-75 groups mentioned media most often, and the 41-50 group was alone in nominating the church most often in response to this question.

D. DISCUSSION

Despite contemporary observations by many that the family is declining in importance, it is clear from this research that, at least for children, the parents are still perceived by all age groups to be the single most notable transmitter of information. For adolescents, the power of the peer group ascends in importance, at least in the eyes of the perceiver. It is of interest that only the 41-50 age group perceived parents to be more important for adolescents than peers (see Table 2). Perhaps people in this age group are most likely to be the

TABLE 2
PERCEPTIONS ACROSS THE LIFE SPAN OF THE MOST IMPORTANT INFORMATIONAL TRANSMITTER FOR ADOLESCENTS

Source	Percent nominated (first choice) Ages 10-14	Ages 15-17	Ages 18-25	Ages 26-30	Ages 31-40	Ages 41-50	Ages 51-75
Parents	25	7	3	14	25	39	24
Peers	38	61	66	55	53	28	33
School, teacher	8	0	6	12	11	19	27
Church	0	0	0	4	0	0	3
Media, TV	8	3	0	0	7	6	3
Self	0	6	11	4	0	3	0
Books	0	0	11	0	0	0	0
Other, no response	21	23	3	11	4	5	10

parents of the current adolescent generation, and therefore they may perceive themselves to be more influential than their offsprings' friends.

The perceived diminutive importance of parents as sources of knowledge for adolescents (and to some extent for children, see Table 1) is striking in the late adolescent/young adult groups. Speculation allows for perhaps one or both of two possible explanations for this finding: it may indeed be true that parents are insignificant informational sources for these young people; on the other hand, these data may reflect the unwillingness of this generation to recognize the continuing importance of their parents in their lives, and thus these data may reflect rejection or rebellion.

Another notable aspect of these findings concerns what was *not* mentioned: i.e., the absence of nominations for other feasibly important agents or institutions. Organized religion was seen as first in importance by only a very small number of persons. Only one subject nominated siblings as premier in importance, and no mention of grandparents was made at all, even for a position of lesser importance. Educational institutions were given first place votes by a small proportion of people, although schools seemed to grow in importance with advancing age of those interviewed. Various forms of mass media, though frequently mentioned in response to question three, were very seldom mentioned as first in importance.

It is important to emphasize that this study reports *perceived* importance of informational sources; the data cannot be said to indicate where a young person obtains various kinds of necessary information in actuality. Despite recent dramatic changes in American society, the present findings suggest that, in general, persons of all ages still hold the traditional views regarding sources of information for young people: parents are most important for children, and peers are most important for adolescents.

E. Summary

Persons in age samples extending across the major portion of the life span were interviewed regarding whom they perceive to be the most important transmitters of information to children and to adolescents. Parents were perceived to be most significant for children, and peers were most significant for adolescents, although the importance of parents for adolescents was also a frequent response category. Agents perceived to be of somewhat lesser importance included the mass media, schools or teachers, and churches. The late adolescent/young adult samples attributed importance to parents less frequently than did any other age group.

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INVESTIGATION OF SOME VARIABLES INFLUENCING STEREOTYPY IN INTERPERSONAL PERCEPTION*

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A. INTRODUCTION

For many years it had been assumed that ethnic stereotypes affect the perception of ethnic group members. Of late, this assumption has received considerable empirical support (1, 6, 7). The influence of the ethnic stereotype on the perception of individual group members has been inferred from the similarity in the subjects' ratings of these individuals to their reactions to the ethnic group in general (5, 6), or from the consistent difference in their ratings of individuals identified with an ethnic group as compared with the ratings of these individuals when they were not identified as members of that group (4). Also, more specifically, it has been demonstrated that the majority group members' (Canadian) judgment of individuals from the minority group (people from India) is more dependent on stereotyped reactions than is their judgment of individuals from their own group (6).

One aim of the present investigation was to conduct a similar experiment with American *S*s to determine the stereotypy in their perception of Negroes; for, in view of the unique nature of the Negro minority in the United States at the present time, similar results were by no means assured. Two other major objectives of this study were (*a*) to determine whether stereotypy in interpersonal perception would increase or decrease with age; (*b*) to discover whether stereotypy in perception is affected as a function of the evaluativeness of the dimension on which the stimulus person is being judged.

B. METHOD

1. *Subjects*

Seventy-eight white American students were divided into three subgroups of 26 *S*s each: eighth graders, high school seniors, and undergraduate university students. The numbers of males and females in each group were ap-

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proximately equal. All the *S*s were from Roman Catholic institutions in the Midwest. The average socioeconomic background of *S*s in all three groups was roughly comparable. The majority of them came from middle class homes.

2. *Procedure*

The *S*s were tested in two group sessions. During the first session they listened to taped individual interviews of four male adults (two Negroes and two whites) on the subject of Walt Disney's contributions to the entertainment media. Each interview lasted approximately 10 minutes. *S*s were also shown the picture of each of these interviewees before the tapes were played. After each interview they rated the interviewee on 12 seven-point semantic differential scales (3), of which six were evaluative in nature and the other six were nonevaluative.

A week later, the same *S*s rated "Negroes in general" and "whites in general" on the same semantic differential scales that were used in the first session. However, for the second session, the order in which these scales were listed was randomized.

C. RESULTS AND DISCUSSION

For each *S* mean ratings of the six evaluative and the six nonevaluative scales were calculated separately for each interviewee. Subsequently, an average was obtained from these scores for the two black and the two white interviewees. Thus, for each *S* there were four scores: (*a*) average rating on the evaluative dimensions for the black interviewees; (*b*) average rating on the nonevaluative dimensions for the black interviewees; (*c*) average rating on the evaluative dimensions for the white interviewees; and (*d*) average rating on the nonevaluative dimensions for the white interviewees. Similarly, for each *S*, average ratings on the evaluative and nonevaluative scales were also obtained for "Negroes in general" and "whites in general."

The indices of stereotyped perception (ISP) were determined for each *S* by the formula: $(x - x_g)^2$ where $x =$ *S*'s average rating of the two interviewees of a particular race, and $x_g =$ *S*'s rating of the ethnic group to which the interviewees belonged. To the extent that a *S*'s perception of the interviewees is influenced by his stereotype of the ethnic group, the two ratings would tend to be similar.

In all, there were four types of ISP scores for each *S*, depending upon the nature of the dimension and the race of the interviewee. These ISP scores were subjected to a $3 \times 2 \times 2$ analysis of variance with repeated measures on the last two factors. The between-groups factor was the age of the *S*s.

The repeated-measures factors included the nature of the dimensions (evaluative *vs.* nonevaluative) and race of the interviewee (Negro *vs.* white).

The analysis of variance showed that for between *Ss* there were no significant effects, indicating that the increasing age and education of the *Ss* did not seem to affect stereotypy in interpersonal perception. It appears that the inclination to perceive various ethnic group members in terms of the ethnic stereotype becomes well established fairly early in life.

For within *Ss*, significant main effects were obtained for evaluativeness of the dimension ($F = 11.63$; df 1/75, $p < .01$), indicating that perception was more stereotyped on evaluative than nonevaluative dimensions. This finding is not unexpected. Osgood, Suci, and Tannenbaum (3), in their work on basic dimensions in meaning of concepts, discovered that the evaluative factor was the most pervasive and accounted for the greatest amount of possible variation in meaning. In their experiments dealing with persons and social issues as concepts, evaluation appeared to be the most important and powerful factor involved. Also, in the literature (2) it has been implicitly assumed that the evaluative-affective components of attitudes have greater resistance to change than the other components.

The failure to obtain significant main effects for the race of the interviewee factor is surprising in view of previous work (6) that indicated that majority group members' judgment of individuals from the minority group was more dependent upon stereotyped reactions than was their judgment of majority group members. In the present study the nonsignificant difference points in the opposite direction. In addition, the race of the interviewee entered into a significant interaction ($F = 6.99$; df 1/75, $p < .05$) with the evaluativeness of the dimension, suggesting that white interviewees were perceived in a more stereotyped manner than the Negro interviewees on evaluative scales. In the light of the recent emphasis on antiracism in the U. S., these findings cease to be very surprising. It is plausible that among educated people it has become fashionable to be antiracist. Consequently, they try to perceive a Negro person as an individual and not as one of a particular category. To what extent it is just a superficial attempt and to what degree their attitude has actually changed cannot be ascertained from the present data. The fact that Negroes are perceived in an even less stereotyped way than members of the *Ss'* own group does make one suspicious about the validity of their reactions.

D. SUMMARY

Stereotypy in person perception as a function of age of the *Ss*, race of the stimulus person, and evaluativeness of the dimension was investigated. The stereotypy did not differ as a function of age. It was greater on the evaluative than on the nonevaluative dimensions and more so for the whites than for the Negroes.

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CREATIVITY, DOGMATISM, AND ARITHMETIC ACHIEVEMENT*

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A. INTRODUCTION

The past two decades have witnessed a quickening of interest in creativity, corresponding somewhat to the earlier concern with the concept of intelligence. One particular aspect of creativity that has implications in the classroom is the relationship of creativity to achievement. A prominent study investigating this relationship was conducted by Getzels and Jackson (5). They formed two groups of secondary school students: one group of 24 students who were in the top 20 percent on measures of creativity but below the top 20 percent on measures of intelligence, and a second group of 28 students who were in the top 20 percent on measures of intelligence but not in the top 20 percent on measures of creativity. The highly creative students scored as high on standardized verbal and mathematical achievement tests as did students who were in the top 20 percent on the intelligence measures. Torrance (10) partially replicated Getzels and Jackson's study 15 times, using the Gates Reading Test and the Iowa Tests of Basic Skills as criteria measures. Ten of the 15 replications derived the same results as Getzels and Jackson's original study did. In the other five studies the high *IQ* group scored higher on achievement scores than did the highly creative group. Yamato (11) also reported results that substantiate those found by Torrance and by Getzels and Jackson.

Dogmatism might also be seen to be related to achievement (and by inference to creativity). Kemp (7) showed that students who were low on Rokeach's (8) dogmatism scale scored higher on measures of critical thinking than did students who were high on this same dimension. Ehrlich (3) showed that dogmatism and achievement in an introductory sociology course were negatively correlated. Christenson (1) used an essay test as a criterion and found no relationship between dogmatism and achievement. Costin (2) found results similar to Christenson's. Thus, the evidence on dogmatism and its

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relationship to achievement is equivocal, whereas several investigations have found useful relationships between achievement and measures of creativity.

B. METHOD AND SUBJECTS

The subjects for the present study were fourth-, fifth-, and sixth-grade students from five selected elementary schools in a moderate-sized North Dakota city. At the onset of the study, the Iowa Tests of Basic Skills (ITBS) were administered to 483 students in the selected group. Three groups were formed on the basis of total scores on the two arithmetic subtests of the ITBS (Arithmetic Concepts and Problem Solving): a high arithmetic achievement group, a middle arithmetic achievement group, and a low arithmetic achievement group. Each group had $N = 161$. The focus of the present study was on comparing the high arithmetic achievement group to the low arithmetic achievement group. The high arithmetic achievement group included those subjects who scored 38 or higher on the total score of the two arithmetic subtests. For members of this high group the arithmetic total test scores ranged from 38 to 65 with a mean of 45.65 and a standard deviation of 6.04. Those subjects who scored below 28 on the total scores of the two arithmetic tests were included in the low arithmetic achievement group, which had a range of 9 to 27, a mean of 21.32, and a standard deviation of 3.79 for the total scores of the two arithmetic tests.

Four additional tests were given to the high and low arithmetic achievement groups—three tests of creativity originally developed by Guilford (6) and one test to measure dogmatism. The first of the creativity tests was the Associations IV Test, a task where students were asked to produce a word that is associated with both of two given words but which has a different meaning in relation to each of the two referent words. For example, one pair of words is emerald and rookie, with the correct answer being green. The Associations IV Test was constructed to be a measure of one dimension of creativity—*fluency*.

The second test of creativity administered was the Utility Test, which is a measure of another dimension of creativity—*flexibility*. In this test, the students were asked to write down as many uses of a wooden pencil as they could. The same procedure was then repeated with the word "brick" as the referent. The number of shifts from one kind of use of the object to different kinds of uses for the object is the score for this particular test.

The third test of creativity was the Consequences Test, where the student was asked to list the consequences of certain hypothetical situations. One such situation is: "What would be the results if none of us needed food any more in order to live?" The score for this test is the number of indirect or remote consequences given. The full test includes 10 such hypothetical situations but, because of a time limitation, only four selected items were administered. The Consequences Test was devised to measure the aspect of creativity called *originality*.

A measure of dogmatism, the elementary school form of the dogmatism scale, devised by Figert (4), was also administered. Figert constructed a scale for elementary school children that would measure the same dimensions that were measured by Rokeach's original scale.

C. RESULTS

The overall question to be answered was: "Did the groups (high and low achievement groups in arithmetic) differ on the three measures of creativity and the dogmatism score?" Because this was a multivariate question (four criterion variables), a multivariate technique was necessary for answering the overall question. Because there were two groups, Hotelling's T^2 test was used, with results as follows: $T^2 = 46.483$, which can be evaluated by a transformation to the F distribution [see Rulon and Brooks (9)] with 4 and 317 degrees of freedom. The previously given T^2 value transforms to $F = 23.172$ which is significant at the .001 level. Thus the two groups did differ in a multivariate sense.

To investigate the differences further, univariate t tests were run on the four variables and are reported in Table 1.

From Table 1 it can be seen that the high arithmetic achievement group outperformed the low arithmetic achievement group on each measure of creativity, with each test significant at the .001 level. However, on the elementary school form of the dogmatism scale, there was no significant difference between the two groups.

TABLE 1
CREATIVITY AND DOGMATISM MEANS AND t VALUES FOR HIGH AND LOW ARITHMETIC ACHIEVEMENT GROUPS

Test	Means of high arithmetic achievement group ($N = 161$)	Means of low arithmetic achievement group ($N = 161$)	t	p
Fluency	3.65	2.22	5.78	.001
Flexibility	5.90	4.34	3.83	.001
Originality	18.46	13.16	9.00	.001
Dogmatism	106.84	107.38	—.52	N.S.

TABLE 2
INTERCORRELATION MATRIX OF THE MEASURES OF CREATIVITY AND DOGMATISM

Measure	Fluency	Flexibility	Originality	Dogmatism
Fluency		.22***	.36***	—.01
Flexibility			.43***	—.04
Originality				—.11*
Dogmatism				

* Significant at .05 level.
*** Significant at .001 level.

To investigate further the interrelationships of the measures of creativity and their relationships to dogmatism, an intercorrelation matrix was formed. These coefficients are reported in Table 2.

It can be seen from Table 2 that dogmatism is only slightly (and negatively) related to the measures of creativity. There does exist some degree of interrelationship among the three measures of creativity.

D. DISCUSSION

The ITBS do not, by inference, seem to be highly related to measures of creativity, since no effort was made to make them serve as a measure of creativity. Indeed the devisers of the ITBS would agree that the arithmetic subtests were intended to measure basic skills rather than to measure creativity. Thus, any relationship found between creativity and the ITBS would be a relationship between a traditional arithmetic test and measures of creativity. It was shown convincingly that such a relationship does in fact exist. On each measure of creativity, the high arithmetic achievement group outperformed the low arithmetic achievement group beyond the .001 level of significance. Thus, when measures of creativity in mathematics are devised, even more dramatic results might be expected.

The finding regarding dogmatism can be examined in relation to previous studies regarding this variable. While Kemp found that low dogmatic students outperformed high dogmatic students on tests of critical thinking, other studies found no difference in relation to performance on traditional type tests. Because the ITBS is a traditional type of test, this finding substantiates past research efforts.

The intercorrelations of the three measures of creativity indicate some degree of relation among the three areas of creativity, but not so much as to imply that the three tests measure the same construct. The relationship of the three measures of creativity to dogmatism is almost a zero relationship. Only the originality measure correlated significantly with dogmatism $(r = -.11, p < .01)$. If this finding holds in future studies, the implication is that dogmatism and creativity are independent of each other. Accordingly, one would expect a dogmatic individual to be neither more nor less creative than a nondogmatic individual.

E. SUMMARY

Two groups of students were formed on the basis of their total arithmetic scores on the ITBS—a high arithmetic achievement group and a low arithmetic achievement group. The groups were respectively the upper and lower thirds of a total group of 483 elementary school students in the fourth, fifth, and sixth grades.

The two groups were subsequently given four tests, three of which were measures of creativity. The tests of creativity, originally prepared by Guilford, were Association IV (fluency), Utility (flexibility), and Consequences (originality). Additionally, a measure of dogmatism appropriate to elementary school children was given. The high arithmetic achievement group scored higher on each of the three measures of creativity ($p < .001$) than did the low arithmetic achievement group. There was no significant difference on the dogmatism variable.

In considering the interrelationships among the three measures of creativity and the dogmatism score, the relationships among the three creativity measures were significant ($p < .001$) and ranged from .22 to .43. On the other hand, only one measure of creativity correlated significantly with the dogmatism score. Originality and dogmatism had a correlation of —.11 ($p < .05$). Thus, a relationship has been established among several measures of creativity and with a standardized measure of arithmetic achievement. No strong relationship exists, however, between dogmatism and a standardized measure of arithmetic achievement.

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SELF-CONCEPT, SPORTS INTERESTS, SPORTS PARTICIPATION, AND BODY TYPE OF SEVENTH- AND EIGHTH-GRADE BOYS*

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A. INTRODUCTION

There is agreement among researchers in child development that formation of a positive self-concept is a vital part of the development and adjustment of the individual. Erikson (1) identifies eight developmental tasks that must be accomplished if the individual is to proceed through his life span with a minimum of deviation from what is expected in terms of his behavior in society. Erikson points to the development of a "positive ego identity" as the task specific for adolescence. Involved in the ego identity is a self-concept that is ultimately acceptable to the individual.

McCandless (5, p. 437) refers to pubescence as ". . . a developmental landmark that has tremendous effect upon the adolescent . . . it forces a dramatic change in the person's notion of himself because of his sudden physiological differences." The self-concept as it relates to or is affected by various dimensions of the physical body has been the focus of a number of studies. Felker (3) hypothesized that body build would be related to self-concept in sixth- and ninth-grade boys, and that perception of father's interest in sports would be related to self-concept and interact with body type to produce significant differences in self-concept scores of sixth-grade boys, and that boys who perceived high father's interest in sports would also have higher self-concept scores than would boys who perceived low father's interest in sports.

B. PROBLEM

In part, the present study using seventh- and eighth-grade boys is a replication of the study by Felker, with extensions to include additional variables of self-interest in sports and instructor ratings of participation in intramural and interschool sports activities. The study was designed to test the following hypotheses:

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H_1: Boys with differing body types will also differ in self-concept scores.

H_2: Boys who perceive high father's interest in sports will score significantly higher on self-concept than boys who perceive low father's interest in sports.

H_3: Heavy body type and perception of high father's interest in sports will interact significantly with self-concept scores.

H_4: Boys with high instructor ratings for intramural and interschool sports participation will have significantly higher self-concept scores than boys with low instructor ratings.

H_5: There will be a significant interaction effect between high father's interest in sports and low instructor ratings of sports participation with respect to self-concept.

C. Method

The sample included all seventh- and eighth-grade boys from a north central Indiana middle school ($N = 153$). The two grade levels were treated as separate samples so that possible developmental differences found could be associated with grade in school. The two sample sizes were $N = 77$ and $N = 76$ for seventh and eighth grades, respectively. All subjects were divided into three body-type groups with the use of the Ponderal Index (P.I.), height in inches divided by the cube root of weight in pounds. The groups were divided as follows on the basis of P.I. values: 12.699 or below were classified as heavy, 12.700-13.499 as balanced, and 13.500 or above as linear.

The measures of self- and father's interest in sports were two parallel forms of the same instrument with the wording on each item changed to apply to the subject or his father. The instruments each had 20 items, four items in each of five categories: sports viewing habits, allegiance to a team or teams, reminiscence of own sports activities, desire for subject to be active in sports, and activity with subject in sports. Included below are several sample items from each of the two forms: (*a*) *Father's interest*—"Takes the whole family to games with him," "Teaches me the rules of outdoor games," "Wants me to play sports in high school"; and (*b*) *Self-interest*—"Like the whole family to go to games with you," "Study the rules of outdoor games," "Want to play sports in high school." The subjects were asked to respond to each item on both forms of the instrument according to how well it described their own or father's interest in sports. Responses were made with the use of four categories: not at all, a little, quite a bit, or a lot, with weights of 1, 2, 3, and 4 associated with the respective categories. The totals of the weighted responses became the measures of self- and father's interest. [Felker (3) reported a split-half reliability of .87 for a sample of 59 fifth- and sixth-grade boys]. Subjects were then divided into high- and low-interest groups (self- and father's) by a median split on interest scores.

Treatment of the data included two 3 × 2 factorial analyses of variance with three levels of body type (heavy, balanced, and linear). The first analysis involved two levels of father's interest in sports (high-low). The second used two levels of self-interest in sports. In addition, two 2 × 2 factorial analyses of variance using father's interest in sports (high-low) were conducted with instructor rating of interschool sports participation (high-low) and ratings of intramural sports participation (high-low). Separate analyses were conducted for each grade level.[1]

The dependent variable in each of the separate analyses was the self-concept score obtained from the Piers-Harris (6) instrument.

The Piers-Harris measure of self-concept was selected for use because of its high reliability across several grade levels (Spearman-Brown odd-even formula .90 and .87 for grades six and 10). It is an 80-item self-report instrument which requires respondents to select from a series of positive and negative statements those that apply to themselves. Self-concept scores are derived by summing the number of positive statements applying to the subject and the number of negative statements that do not apply to the subject as he selects them on the basis of his self-perceptions.

D. RESULTS

Results of the separate analyses of variance for grades seven and eight showed:

1. As stated in hypothesis 1, the main effect of body type on self-concept scores was significant ($F_{2,70} = 3.13, p < .05$). This was true for the seventh-grade sample only.
2. In all comparisons involving eighth-grade subjects, those who perceived high father's interest in sports scored significantly higher in self-concept than did subjects in the same sample who perceived low father's interest in sports ($F_{1,70} = 5.04, p < .05$). Thus, hypothesis 2 was supported for the eighth-grade sample only.
3. Eighth-grade subjects with high self-interest in sports scored significantly higher on self-concept than did eighth-grade subjects with low self-interest in sports ($F_{1,70} = 4.80, p < .05$).

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[1] ANOVA tables are available from the authors at Purdue University, Lafayette, Indiana 47907.

4. No significant interaction was found between heavy body type and father's interest in sports. Hypothesis 3 was not supported for either sample.

5. The eighth-grade subjects with high instructor ratings for the interschool sports participation had significantly higher self-concept scores than subjects from the same sample with low instructor ratings ($F_{1,66} = 4.37$, $p < .05$). Thus, hypothesis 4 was supported for the eighth-grade sample only.

6. No significant interaction was found between high father's interest in sports and low instructor ratings of sports participation. These results did not support hypothesis 5.

E. Discussion

The results suggest that some changes occur betwen the seventh and eighth grades which appear to be associated with the development of self-concept in early adolescent boys. Felker (3) found significant differences in self-concept scores associated with the three body types (heavy, balanced, and linear) for sixth-grade boys. He found no such differences for ninth-grade boys. Staffieri (8) found certain stereotyped expected behavior/personality traits associated with body type in elementary school children ages 6 to 10. Mesomorph boys (similar to balanced body type in this study, since Staffieri also used the Ponderal Index as one of his measures of body type) apparently receive favorable peer recognition as a result of their attractive physical appearance. The results of this study provide some indication that sixth- and seventh-grade boys are similar with respect to the influence of body type on self-concept. These results also suggest that body type loses its influence on self-concept at about age 13 or 14 (age associated with grade eight) and is replaced by other factors.

Examination of a general maturation or growth curve including observable body dimensions and selected internal organs (4) reveals an increase in rate of growth at about 12-13 years of age. These increases include muscle size and strength, bone size, vital capacity, efficiency of the blood to handle lactic acid, and the rate of increase in height and shoulder breadth. Closely associated with increase in maturity as indicated by these changes in body size and function are increases in motor performance and coordination (2). Because of these changes the adolescent boy is capable of a higher level of sports participation and competition than is the preadolescent boy. The increased capacity for sports participation is a new source of status and self-esteem operating in the older group, and perhaps replaces or modifies body appearance as an influence on self-concept.

A suggested hypothesis is that for those boys who experience these stated increases at this time, interest in sports and rewarding experiences in sports activities act to increase the individual's perception of himself and thus affect self-concept. Whereas prior to the pubescent growth spurt body type has been associated with stereotyped expectancy behaviors which may have influenced self-concept, these increases in physical capacity may act to overshadow or replace any such influences. Inherent in this hypothesis is the suggestion that opportunity to develop physical skills and participate in a rewarding style will act to enhance the positive influence on the self-concept of adolescent boys.

The hypothesized change in the source of status and self-esteem opens several avenues for additional research in this area. Three suggestions are (*a*) a combined replication of the study by Felker (3) and the present study with the use of subjects from grades six through nine. Smith (7) refers to replication and cross-validation studies as basic to good research. A replication using grade six through nine boys all drawn from the same sample would seem to be appropriate; (*b*) a longitudinal study focusing on the changes in sports interest, participation, and body type as they relate to self-concept across grades six to nine inclusive; and (*c*) a study similar to the present one using a more direct measure of physical abilities and comparing the effect of these abilities on self-concept scores at the four grade levels. If the rationale explaining the present results is valid, then a relationship between physical abilities and self-concept should begin to show in grade eight.

F. SUMMARY

A sample of 153 seventh- and eighth-grade boys was used to study the effects on self-concept of body type, self- and father's interest in sports, and instructor ratings on intramural and interschool sports participation. The subjects were classified by body type (heavy, balanced, and linear) with the Ponderal Index (height in inches divided by the cube root of weigth in pounds). Subjects were divided on all other variables by a median split.

Analyses of variance revealed a significant effect upon self-concept by body type for the seventh-grade subjects only. Self-interest in sports, father's interest in sports, and instructor ratings of interschool sports participation showed significant effects upon self-concept scores of the eighth-grade subjects.

The differing effects on self-concept scores of the selected variables for the seventh- and eighth-grade subjects suggest a physiological variable, maturation.

Puberty brings a sudden increase in physical maturation and capability leading to an increased interest in sports participation. This capability and interest seem to overshadow body type in influencing self-concept.

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SEMANTIC DIFFERENTIAL ANALYSIS OF MEN'S FIRST NAMES*[1]

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A. INTRODUCTION

Names are fascinating. Over the years psychologists have shared in this fascination with a number of investigations. Names are important to the student of personality because they become part of the individual's self-concept. Plottke (9) developed the implication taken from Adler that an individual can develop feelings of inferiority (or superiority) over his name. These feelings, in turn, influence the self-image. Sherif and Cantril (13) have also commented on the ego-involving aspects of names. Brender (2) has provided an excellent analysis of the psychodynamic aspects of the naming process: i.e., how parents select names.

A review of the psychological literature shows studies relating to both first and family names. This report is directed to first names. Previous investigations of first names relate to (*a*) like-dislike of one's own name, (*b*) like-dislike of one's own name and adjustment, (*c*) uniqueness of name and adjustment, (*d*) stereotyping of names, and (*e*) general statements on names: i.e., men prefer common names; women, less common.

Like-dislike of one's own name: Several investigators have reported that, while most people like their names, sizeable percentages do not. In a sample of college students Allen, Brown, Dickinson, and Pratt (1) reported that 40% of the men and 46% of the women were dissatisfied with their first names. Strunk (16), also with college students (both men and women), reported that 22% disliked their names. Eagleson (3) found that 14% of Negro college women disliked their names.

Like-dislike of one's own name and adjustment: Three studies have dealt with the relationship of an infrequent or uncommon name to personal adjustment: Ellis and Beechley (4), with children in mental health clinics;

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[1] Appreciation is expressed to the Computer Center, State University College, Fredonia, New York, for statistical analysis. This project was supported in part by a grant from the Office of Graduate Studies and Research, State University College, Fredonia.

Savage and Wells (11), with Harvard students; and Houston and Sumner (5), with Negro coeds. All studies indicate a poorer level of adjustment for those with infrequent names than for those with common names. However, Savage and Wells do indicate that students with unusual names also did proportionately better on the Harvard Grant series than did students with usual names, thus suggesting that the influence of an unusual name could be either positive or negative.

Stereotyping of names: Razran (10) did a study of stereotypes of last names. Walton (17), Allen *et al.* (1), Schoenfeld (12), and McDavid and Harari (6) showed that stereotyping of first names takes place, but the number of names reported is very limited.

General statements about names: Preference for more common names by men is reported by Allen *et al.* and a preference for less common by women by Allen *et al.* and by Eagleson.

The studies suggest that there is some relationship among evaluation of one's name, self-concept, and adjustment. Does the person with a poor adjustment tend to reject his name because it is part of his self-image? Or, is the name itself, as suggested by McDavid and Harari, a factor in bringing about a poor adjustment? The evidence does seem to suggest that for some people a name may be a contributing factor toward poor adjustment but not, as Savage and Wells point out, for all.

While the general question of the relationship of names and adjustment cannot now be answered, there are some aspects of the problem that can be attacked. What is needed first is an expansion of the work of Walton and Allen *et al.* so that there is a systematic investigation of how people currently evaluate names. It is also necessary that a larger number of names be investigated. Walton did 18 men's names; Allen *et al.*, 10; Schoenfeld, 8; and McDavid and Harari studied a number of names, but did not indicate which names were used.

Improved techniques for measuring attitudes are now available with the development of the Osgood semantic differential (8, 15). The Osgood procedure offers the advantages of being able to measure a larger number of names along more than one dimension and, further, can show the relationship of different names to one another.

This investigation is directed at using the semantic differential to (*a*) confirm the existence of stereotypes with 25 common first names and names from a random list; (*b*) determine whether common names are more desirable than less common—being desirable in this sense means following Osgood whether common names are closer to Good than Bad (Evaluation), Strong than Weak (Potency), and Active than Passive (Activity); (*c*) determine whether there are differences between men and women in the perception of names.

B. METHOD

1. *Semantic Differential*

The rating procedure used was based upon the work of Osgood *et al.* (8). The specific form was taken from Osgood and Luria (7) and consists of 10 subscales: *valuable-worthless, fast-slow, large-small, tense-relaxed, clean-dirty, active-passive, strong-weak, tasty-distasteful, hot-cold,* and *deep-shallow.* Two groups of concepts were rated. The first group included the following: Good, Bad, Strong, Weak, Active, and Passive. These were to serve as reference points for Osgood's Evaluative, Potency, and Activity dimensions. The second group of concepts consisted of men's names. The dimension concepts were rated first in random order, followed by the names, also in random order. The randomization was such that no two *S*s had either the dimension concepts or names in the same order. In determining the categories of names, all male names in the student directory were first counted. There were 176 names altogether. The 25 most common names were included in Study I.

Study II used a combination of common names and random names so that comparisons could be made (a purely random sample of names included few common names; an all-random sample raised the question of whether the *S*s in both studies were comparable). The common names were the 10 with the highest frequency and 10 drawn randomly. One of the random names was Lawrence, already included in Study I, but not among the first 10. It is also worth noting that the 25 common men's names were held by about 63% of all the men on the campus.

2. *Subjects*

*S*s were undergraduate students from several departments at State University College, Fredonia, New York. There were 50 men and 50 women in Study I (common names); 40 men and 40 women in Study II (common-random names).

3. *Procedure*

The instrument was administered in booklets using conventional semantic differential rating instructions. The concepts to be rated were presented in printed booklets with a single concept name heading each page and with the 10 rating scales below. *S*s recorded their sex, year, and, in the case of males, their own first name.

C. RESULTS

In order to do the computations it was first necessary to develop several FORTRAN programs for use with data processing equipment. These programs are now available for other programs as well.[2]

Initially, means and standard deviations were computed on each of the subscales for each of the dimension concepts—Good, Bad, Strong, Weak, Active, and Passive—and for each of the names. Inspection of the data shows that concepts and names have a good range and that the standard deviations average less than 1.5.[3] Following Osgood *et al.* (8, p. 328) we can assume that, with the dispersion of means and with standard deviations of the magnitude found, stereotypes do exist. The differences are particularly clear for the dimension-concepts; less clear, as might be expected, on the names themselves (additional confirmation of the existence of stereotyping is provided by later analyses where significance levels would not occur if a shared stereotype were not present).

The data were then analyzed in terms of the D scores suggested by Osgood. This procedure has several steps. For each S D scores are computed with the generalized distance formula, $D = \sqrt{d^2}$ in which d is the difference in the rating of a concept on two subscales. The 10 subscales for each concept were then combined into a single D score. Thus, for each case D scores were computed for each concept against every other concept on all 10 subscales. For names perceived as close together (or for dimension-concepts), D would be small; for names farther apart, D would be large. The assumption was that the rating of Good and Bad as concepts would represent the Evaluative dimension; Strong and Weak, the Potency; Active and Passive, the Activity.

The distribution of *D*s was not known, and a nonparametric statistic was employed for analysis. The Wilcoxon matched pairs procedure (14) was used with the *D*s to determine whether a name was rated significantly closer to Good or to Bad, to Strong or to Weak, to Active or to Passive. These data are shown in Table 1 for Study I and Table 2 for Study II.

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[2] Appreciation is expressed to Kathy J. Chmura and George H. Golden, Jr. for writing the programs. Copies of the programs may be obtained on request from Director, Data Processing Center, State University College, Fredonia, New York 14063.

[3] Copies of the means may be obtained on request from the author.

TABLE 1
WILCOXON SIGNIFICANCE LEVELS ON THREE DIMENSIONS OF MEANING FOR COMMON NAMES

Name	Frequency[a]	Good-Bad		Strong-Weak		Active-Passive	
		Men	Women	Men	Women	Men	Women
Alan	1.23%	NS	.001	.026	.009	NS	.037
Bruce	1.31%	.029	NS	.002	.006	.004	NS
Charles	1.85%	.016	.001	NS	.004	NS	.002
Daniel	1.62%	.001	.001	.001	.001	.001	.001
David	3.86%	.001	.001	.001	NS	.001	NS
Dennis	1.16%	.003	.001	.001	NS	.002	.003
Donald	2.16%	.006	.020	.001	NS	NS	NS*
Douglas	1.47%	NS	.001	.009	.002	NS	.021
Edward	1.47%	.022	.001	NS	.015	.007	.001
Frederick	1.23%	.041	.036	NS	NS	NS	NS*
Gary	2.55%	NS	.009	NS	NS	NS	NS
George	1.08%	NS	NS	NS	NS*	NS	NS*
James	4.17%	.003	.001	.019	.001	.002	.006
John	6.65%	.007	.001	NS	.001	.021	.001
Joseph	2.32%	.009	.001	.001	.001	.001	.001
Kenneth	1.78%	.020	.016	.002	NS	.010	NS
Lawrence	1.78%	.017	NS	NS	NS	NS	NS*
Michael	3.40%	.003	.011	NS	.005	.015	.001
Peter	1.39%	NS	.001	NS	.001	NS	.002
Paul	2.70%	.004	.001	NS	.001	.049	.001
Richard	4.95%	.005	.001	NS	.001	.048	.001
Robert	5.72%	.004	.001	.017	.001	.005	.001
Ronald	1.66%	NS	.013	NS	NS	NS	NS
Stephen	1.54%	NS	.001	NS	.002	NS	NS
Thomas	3.86%	.005	.001	.003	.003	NS	.001

Note: D values were computed between Good *vs.* each name, Bad *vs.* each name, and then compared with the Matched Pairs procedure. Thus Bruce, for men, was significantly closer to Good than Bad at the .029 level; Alan, for women, at the .001 level.

[a] Refers to the percentage of male students on the campus bearing that name.

* Indicates those values that were closer to the *second* concept of the dimension: Bad, Weak, or Passive. All others were closer to Good, Strong, or Active.

The tables show the probability level of each name as closer to one end of the dimension or the other. The frequency of each name on the campus is also shown. As Table 1 shows, men rated all of the names in Study I (common names) closer to Good than Bad, to Strong than Weak, and to Active than Passive. Men rated David, Daniel, and Dennis the highest on a composite score of ranks on the three dimensions. Women rated Daniel, Richard, and Robert the highest. However, most of the common names were clustered very closely together. George and Frederick were lower for both men and women.

Table 1 shows both men and women ranked the majority of men's names significantly closer to Good than Bad. Half or better of the names were seen as significantly closer to Strong than Weak; to Active than Passive. Thus,

TABLE 2
WILCOXON SIGNIFICANCE LEVELS ON THREE DIMENSIONS OF MEANING FOR COMMON-RANDOM NAMES

		Good-Bad		Strong-Weak		Active-Passive	
Name	Frequency[a]	Men	Women	Men	Women	Men	Women
				Common names			
David	3.86%	.001	.001	NS	.001	.001	.001
Gary	2.55%	.004	.048	.013	.022	.005	NS
James	4.17%	.001	.001	.001	.001	.001	.001
John	6.65%	.001	.001	.001	.001	.004	.001
Joseph	2.32%	.001	.001	.003	.001	.003	.001
Michael	3.40%	.001	.001	.001	.001	.001	.001
Paul	2.70%	.003	.001	.001	.003	.007	.042
Richard	4.95%	NS	.003	.023	.002	NS	.003
Robert	5.72%	.001	.001	.001	.001	.001	.001
Thomas	3.86%	.001	.001	.014	.001	.001	.004
				Random names			
Andrew	.38%	.001	.003	NS	NS	NS	NS
Bernard	.30%	.032	NS	NS*	NS	NS*	NS*
Dale	.85%	.007	.003	NS	NS	.037	NS
Edmond	.15%	.008	.005	NS*	.035	NS	NS
Gerd	.07%	NS*	NS*	NS*	NS*	.046*	NS*
Ivan	.07%	NS*	NS	.001	.002	NS	.045
Lawrence	1.78%	.001	.020	NS	.024	NS	NS
Mathew	.07%	.001	.001	.011	.001	.013	.001
Raymond	.85%	.006	.024	.025	NS	NS*	NS
Stanley	.30%	NS*	NS	NS*	NS*	NS*	NS*

Note: D values were computed between Good *vs.* each name, Bad *vs.* each name, and then compared with the matched pairs procedure. Thus, for men Andrew is significantly closer to Good.

[a] Refers to the percentage of male students on the campus bearing that name.

* Indicates those values that were closer to the *second* concept of the dimension: Bad, Weak, or Passive. All others were closer to Good, Strong, or Active.

there is a clear tendency for common men's names to be seen as closer to Good, and most of the names as closer to Strong and Active.

Table 2 shows the rankings of the common-random sample of men's names. While most of the names were rated closer to Good, Strong, and Active, some names, such as Bernard, Stanley, and Gerd, were rated as closer to Bad, Weak, or Passive by men, women, or both. Since 11 of the names were the same as in Study I, some comparisons are possible. In evaluating the significance levels of ratings, 51 of 66, or 77%, were at the same significance levels in Study I as in Study II. That is, if a name was significantly close to Good on Study I, it tended to be significantly close on Study II also. When the names in Study II are evaluated, the most striking observation is that the names also in Study I, the common names, are closer to the positive than to the negative concepts.

In order to evaluate the effect of frequency of occurrence of a name and its rating, rank correlations were computed with the use of frequency and relative position to Good, Strong, Active, and a composite index. These results are shown in Table 3. In Study I men's ratings showed a correlation between nearness to Good and frequency; women's ratings, between Strong and the composite index. With Study II there were significant correlations for both men and women on all indices. These higher correlations might be expected, since the combination sample had a greater range. These correlations tend to support the hypothesis that frequency of a name is correlated with positive evaluation. That is, higher frequency names are closer to Good, Strong, and Active.

TABLE 3
RANK CORRELATIONS OF FREQUENCY OF NAME WITH RANK OF SEMANTIC DIMENSIONS

	Good-Bad		Strong-Weak		Active-Passive		Composite	
Names	Men	Women	Men	Women	Men	Women	Men	Women
Common ($N = 25$)	.68**	.17	.02	.43*	.34	.39	.35	.46*
Common-Random ($N = 20$)	.47*	.54*	.54*	.53*	.58*	.49*	.78**	.50*

* Significant at the .05 level.
** Significant at the .01 level.

TABLE 4
RANK CORRELATIONS BETWEEN RANKINGS OF MEN AND WOMEN ON SEMANTIC DIMENSIONS

Names	Good-Bad	Strong-Weak	Active-Passive	Composite
Common $N = 25$	.26	.18	.35	.32
Common-Random $N = 20$	.75**	.70**	.63**	.71**

** Significant at the .01 level.

Agreement of judgments by men and women was evaluated by correlating the average rankings on each of the indices. Correlations with the common names were low but, again, this would be expected with a truncated distribution. The correlations with the common-random names (Study II) were all significant beyond the .01 level, indicating a relatively high level of agreement of rating of names by men and women.

Another way to demonstrate the relationship of the ratings is by construction of a three-dimensional model based upon the group *D* scores with the technique described by Osgood *et al.* (8, pp. 91-104). For this procedure the means were first calculated for all *S*s on each subscale of each concept dimension and name rated. Then group *D* scores were obtained. Figures 1 and

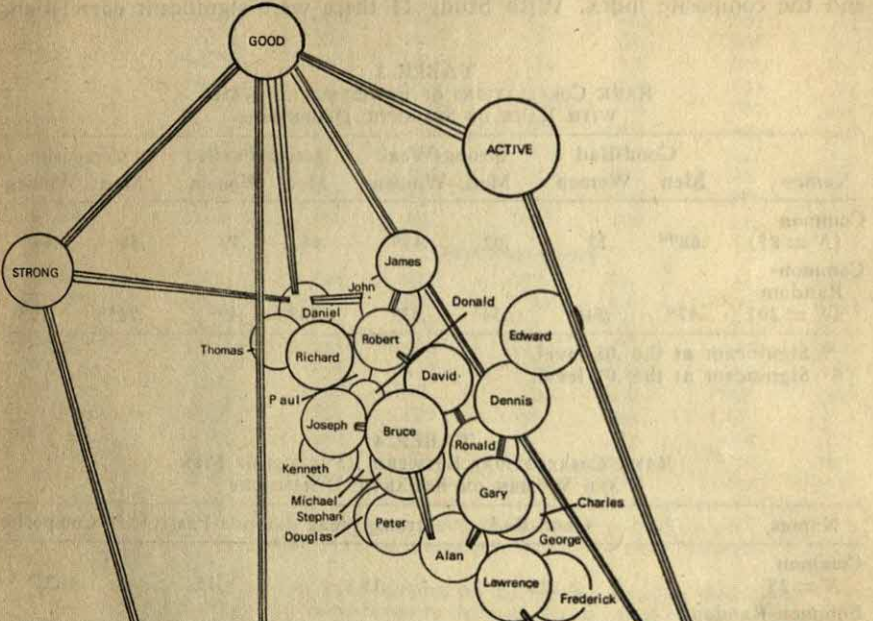

FIGURE 1
THREE-DIMENSIONAL MODEL OF MEN'S RATINGS OF 25 COMMON NAMES

2 show models constructed from ratings of men and women on common men's names. Figures 3 and 4 show the models for the sample of common-random names.

These figures show the relationship of the names to each of the concepts chosen to represent the Evaluation, Potency, and Activity dimensions, as well as to one another. While the procedures are somewhat different, the interpretations generally follow Tables 1 and 2. Thus for men (Study I), Daniel was rated close to Good, Strong, and Active; James closer to Active than Strong; Gary, George, and Frederick closer to Bad, Passive, and Weak. Women rated John, Daniel, and Robert highly; George, Frederick, and Donald were low: i.e., closer to Bad, Weak, and Passive. Figures 3 and 4 show the results of Study II. Both men and women ranked Robert, James, and Michael high, while rejecting Bernard, Stanley, and Gerd. The high

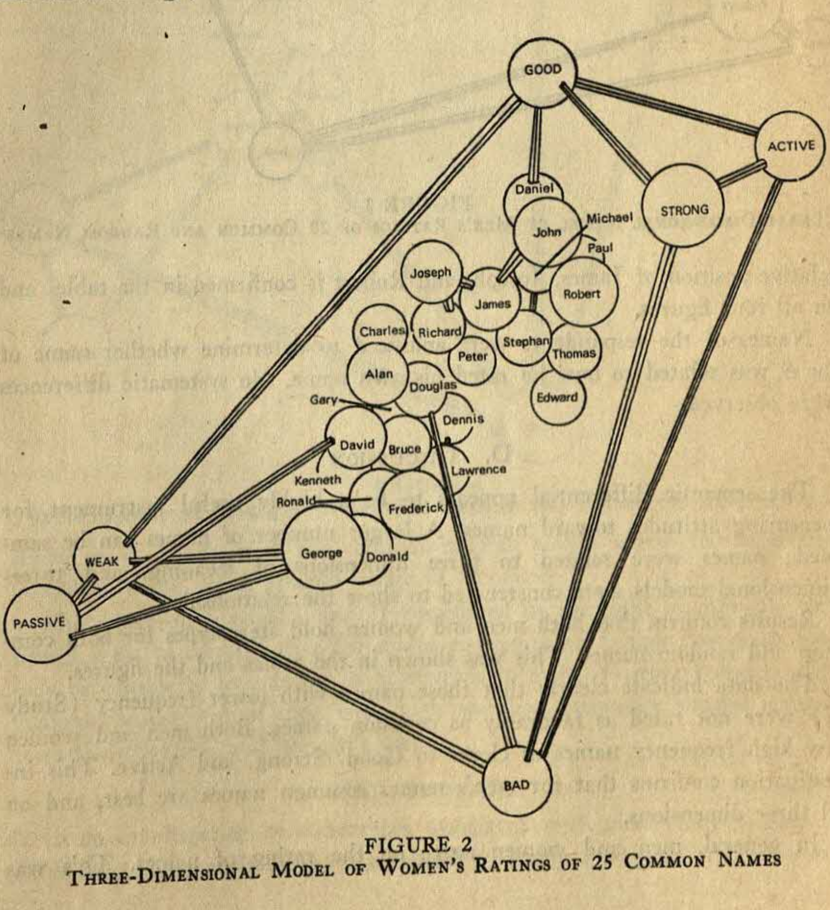

FIGURE 2
THREE-DIMENSIONAL MODEL OF WOMEN'S RATINGS OF 25 COMMON NAMES

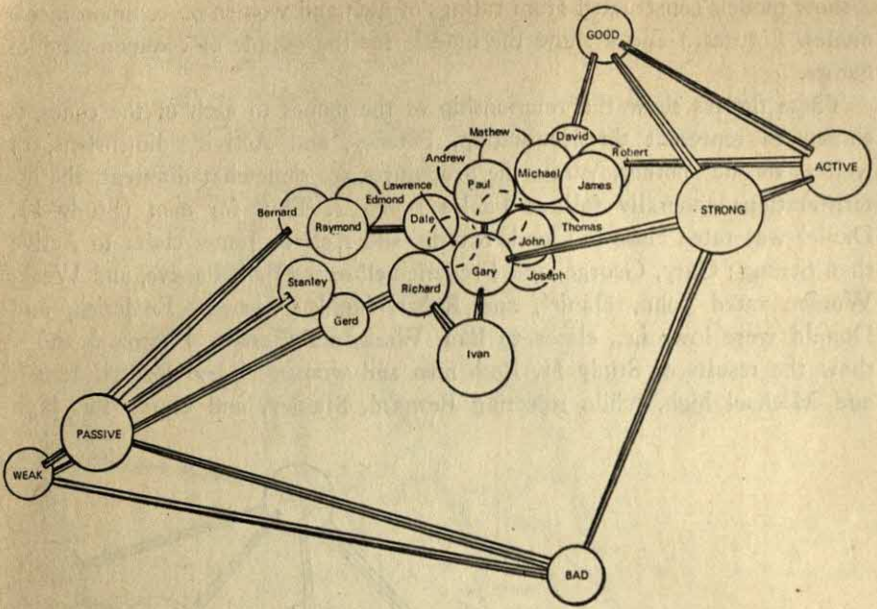

FIGURE 3
THREE-DIMENSIONAL MODEL OF MEN'S RATINGS OF 20 COMMON AND RANDOM NAMES

relative position of James, Joseph, and Robert is confirmed in the tables and on all four figures.

Names of the respondents were analyzed to determine whether name of the *S* was related to how he rated his own name. No systematic differences were observed.

D. DISCUSSION

The semantic differential appears to be a highly useful instrument for measuring attitudes toward names. A larger number of names can be sampled; names were related to three dimensions of meaning, and three-dimensional models were constructed to show the relationships.

Results confirm that both men and women hold stereotypes for both common and random names. This was shown in the tables and the figures.

The data indicate clearly that those names with lower frequency (Study II) were not rated as favorably as common names. Both men and women saw high frequency names as closer to Good, Strong, and Active. This investigation confirms that for men's names common names are best, and on all three dimensions.

In general, men and women agree on the rating of names. This was

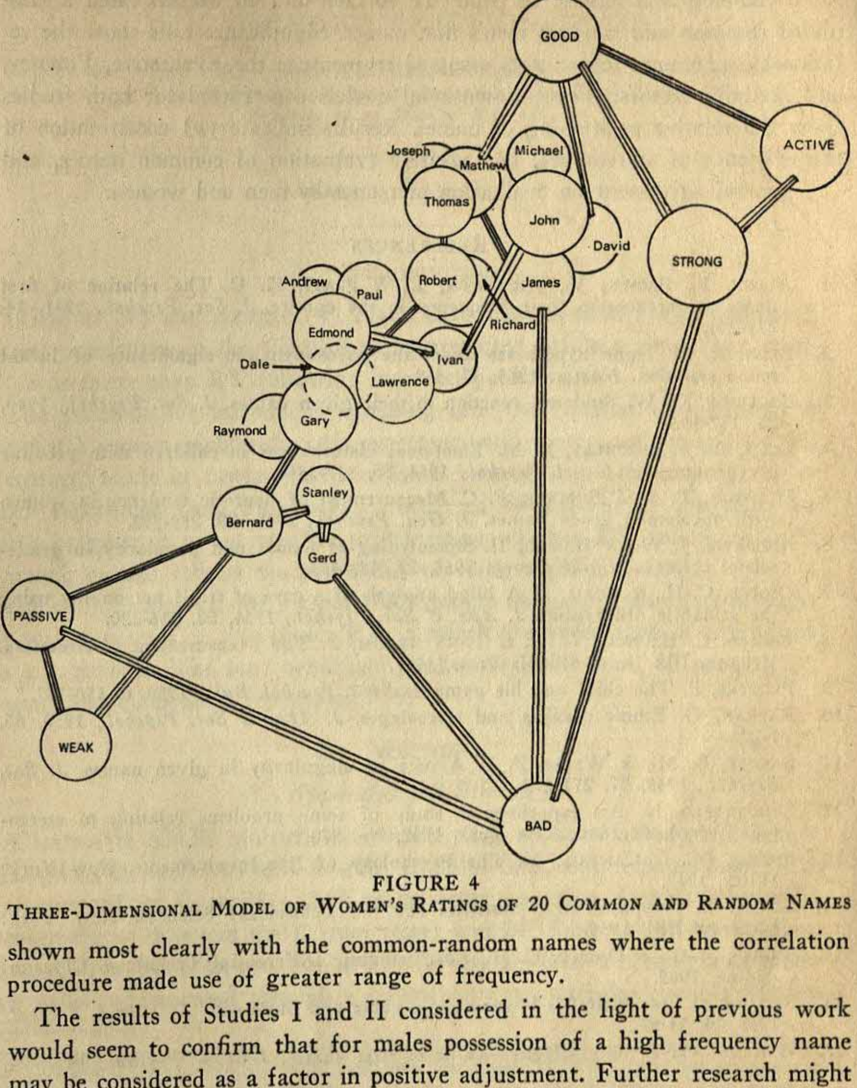

FIGURE 4

THREE-DIMENSIONAL MODEL OF WOMEN'S RATINGS OF 20 COMMON AND RANDOM NAMES

shown most clearly with the common-random names where the correlation procedure made use of greater range of frequency.

The results of Studies I and II considered in the light of previous work would seem to confirm that for males possession of a high frequency name may be considered as a factor in positive adjustment. Further research might evaluate adjustment of men with high and low frequency names, attitudes toward nicknames, and women's names.

E. SUMMARY

In an investigation of stereotypes associated with men's first names, 180 *S*s completed semantic differential scales. In Study I 50 men and 50 women

rated common first names. In Study II 40 men and 40 women rated a sample of common and random men's first names. Significance tests show the relationship of names to concepts assumed to measure the Evaluative, Potency, and Activity factors. Three-dimensional models constructed for both studies show the relative positioning of names. Results indicate (*a*) confirmation of the existence of stereotypes, (*b*) positive evaluation of common names, and (*c*) general agreement on evaluation of names by men and women.

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THE EFFECT OF RIGHT AND WRONG GUESSES ON TWO-CHOICE REACTION TIME*[1]

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MARTIN HANNES

A. INTRODUCTION

Williams (7) and Kriegel (4) found that reaction time (RT) following correct predictions of the stimulus to be presented (from a set of two stimuli) was faster than RT following incorrect predictions.

The rationale for introducing guessing into the reaction time procedure was that *S*'s guess might reflect his expectancy and consequent set and would, if correct, result in faster reactions. Both investigators used a program in which repetitions (and alternations) occurred 50 percent of the time. In such a program it is not possible to determine whether RT following right or wrong guesses reflects the probability of being right or wrong.

The main purpose of the present study was to determine the effect of right and wrong guesses on two-choice RT in which the percentage of repetitions was a parameter. The four conditions used were 20 percent, 40 percent, 60 percent, and 80 percent repetitions.

B. METHOD

1. *Apparatus and Stimuli*

A Lafayette 6302B multichoice reaction time apparatus was used, which consisted of an experimenter's module, stimulus unit, and response keys. The *S* was seated in front of a 24" semicircular partition (which effectively screened the module and the *E* from view) and 24" from the 4" × 4" stimulus box. The stimulus, programmed by *E*, was a red or a blue light of moderate intensity presented through a centrally located circular opening ½" in

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diameter. The response unit was located 9″ in front of the stimulus light and consisted of two heavy-duty telegraph keys mounted on an 8″ × 11″ base and requiring about 250 grams of force to effect a response. A third center key (3¼″ from either response key) was secured and covered and served as a home key. The stimulus presentation activated a clock which was accurate to ± 1 msec. Both the stimulus and the timer were terminated when the appropriate response key was depressed.

2. *Subjects and Procedure*

The *S*s were 40 undergraduate student volunteers enrolled in introductory courses in psychology at Herbert H. Lehman College. The 40 *S*s were randomized into four groups of 10. Each group was tested under one of the four conditions (20 percent, 40 percent, 60 percent, 80 percent repetitions). *S*s were informed of the statistical structure of the particular program to which they were assigned. In order to ensure understanding each *S* was required to generate a random sequence of eight stimuli conforming to his condition. This sequence was then presented to *S* as practice trials. Two blocks of 51 experimental trials balanced for frequency of stimuli occurrence were then presented with a five-minute rest period between blocks. On each trial *S* was required to guess the stimulus to be presented and then to act appropriately and as rapidly as possible—whether his guess was confirmed or not—to the onset of the stimulus, with his preferred index finger. The stimulus was presented 2-3 seconds after the guess and *S* was informed of his reaction time after each trial.

C. RESULTS AND DISCUSSION

Each *S*'s reaction time date (the last 50 responses of each block) was distributed into four categories corresponding to the cells in the matrix (Figure 1) and averaged, generating four means for each *S*.

It should be noted that each of the sequences (RR, AR, RA, AA) reflects what occurred chronologically; thus, "RA" refers to that category of data resulting when the guess *R*epetition was followed by the event *A*lternation.

The data for one *S* assigned to the 80 percent repetition (REP) condition were eliminated from the analysis as being nonrepresentative as each of her four means was two or more standard deviations above the four corresponding grand means for the other *S*s in the condition ($p < .00001$). A second *S* in the 80 percent REP condition never guessed alternation (ALT) prior to its occurrence and, hence, provided no AA data. Accordingly, there were for the 80 percent REP condition nine means for the RR, RA, AR categories and eight means for the AA category. There were, as anticipated, 10 means for each of the four categories in the 20 percent, 40 percent, and 60 percent REP conditions.

		EVENT	
		Repetitions	Alternations
GUESS	Repetitions	Right guess (RR)	Wrong guess (RA)
	Alternations	Wrong guess (AR)	Right guess (AA)

FIGURE 1
CATEGORIES OF DATA AS A FUNCTION OF GUESS AND EVENT

Grand means were determined for each of the categories in each of the conditions and are plotted in Figures 2, 3, and 4.

It is clear from these figures that under all conditions, for both REPs and ALTs, respectively, RT associated with wrong guesses is longer than RT associated with right guesses. It is also apparent that RT tends to decrease as the percent REPs increases (Figure 2) both for RR and AR data, and RT tends to decrease as the percent ALTs increases (Figure 3) for AA data. An analysis of variance was carried out separately for each of the four curves (although the data for each curve are based on independent measurements, the data across curves are not). F was significant for the RR curve—$F_{3,35} = 6.97$ ($p < .01$)—for the AR curve—$F_{3,35} = 3.70$ ($p < .05$)—and insignificant for the AA and RA curves. An examination of whether a systematic trend existed (3) indicated that there was significant positive association between RT and percent ALTs for the AA data—$F_{1,34} = 4.13$ ($p < .05$)—but not for the RA data. Scheffe's procedure for multiple comparisons (2) was applied to the RR and AR data. For RR data it was found that the 80 percent REP condition generated RR data that were significantly different from RR data in the 60 percent REP condition ($p <$

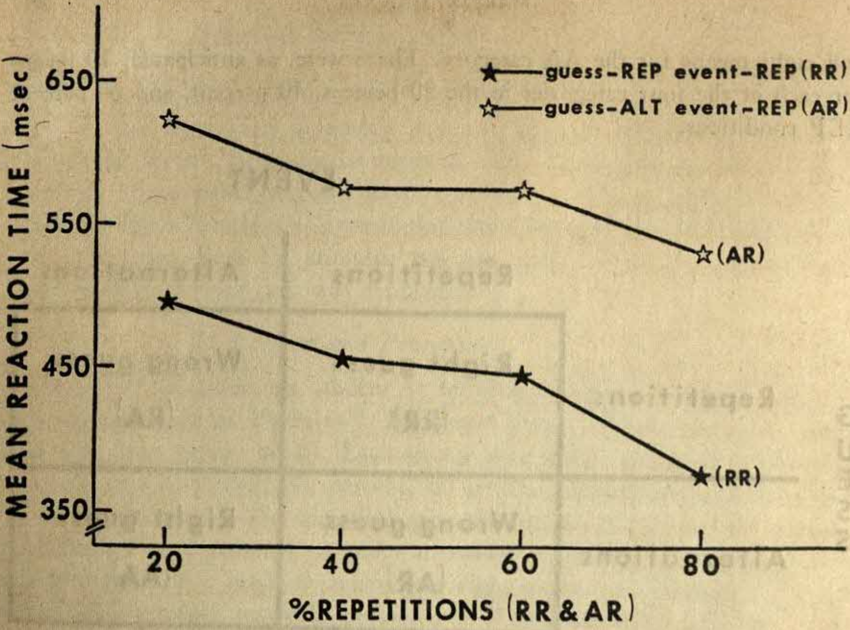

FIGURE 2
Mean Reaction Time as a Function of Percent Repetitions

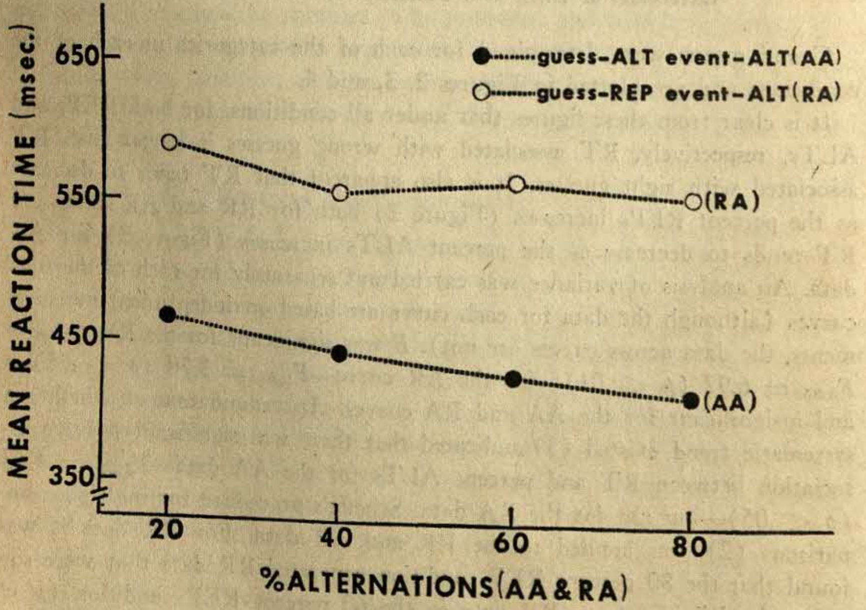

FIGURE 3
Mean Reaction Time as a Function of Percent Alternations

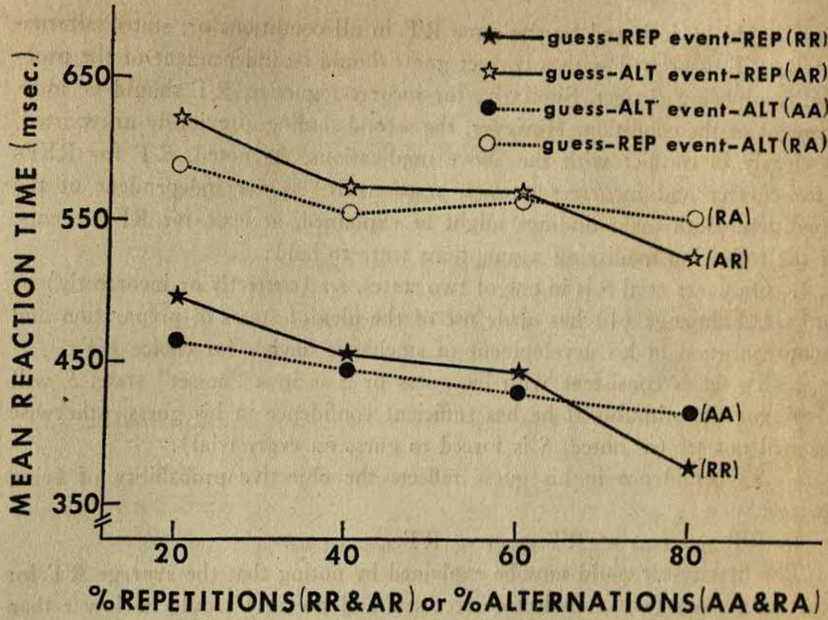

FIGURE 4
MEAN REACTION TIME AS A FUNCTION OF PERCENT REPETITIONS AND PERCENT ALTERNATIONS, RESPECTIVELY

.10), from RR data in the 40 percent REP condition ($p < .05$), and from RR data in the 20 percent REP condition ($p < .01$). For AR data the 80 percent REP condition produced data that were significantly different from the AR data in the 20 percent REP condition ($p < .05$). None of the other comparisons generated significant differences at the 10 percent level or better.

The two main findings in this study were (*a*) RT following right guesses (for REPs and ALTs respectively) is faster than RT following wrong guesses over the whole range of conditions examined. (*b*) RT to REPs, for correct guesses and incorrect guesses respectively, decreased as the percentage of REPs in a condition increased.

The first finding extends the previously reported "right guess *vs.* wrong guess effect" from the single condition in which REPs occur 50 percent of the time to conditions in which REPs occur 20 to 80 percent of the time. This result is consistent with the following hypothesis: correct and incorrect guesses reflect correct and incorrect sets respectively and $RT_{\text{correct sets}} < RT_{\text{incorrect sets}}$. This hypothesis implies that RT is determined by whether the set is correct or not. Accordingly, a correct guess (and therefore a correct set) should be followed by the same RT in all conditions or, stated alternatively, RT associated with a correct guess should be independent of the probability of being correct. Similarly, for incorrect guesses, RT should be independent of the condition. However, the second finding, previously unreported, is clearly in conflict with the above implications. As noted, RT for REPs (for correct and incorrect guesses, respectively) is *not* independent of the condition. Both main findings might be explained, at least for REP events, if the following modifying assumptions were to hold:

1. On every trial *S* is in one of two states, *set* (correctly or incorrectly) or *not set*. Falmange (1) has made use of the idea of states of preparation and nonpreparation in his development of stochastic models for choice RT.
2. *S*'s set is consistent with his guess or *S* is in a "no-set" state. *S* will "set" for the stimulus if he has sufficient confidence in his guess, otherwise he will not set (as noted, *S* is forced to guess on every trial).
3. *S*'s confidence in his guess reflects the objective probability of being correct.
4. $\mathrm{RT}_{\text{correct set}} < \mathrm{RT}_{\text{no set}} < \mathrm{RT}_{\text{incorrect set}}$.

The first result could now be explained by noting that the average RT for correct guesses (which reflect correct sets and no sets) would be lower than the average RT for incorrect guesses (which reflect incorrect sets and no sets). The second result could now be explained by noting (refer to assumptions 3 and 4) that the ratio of correct sets to no sets (for RR data), as well as the ratio of no sets to incorrect sets (for AR data), would increase as a function of the probability of REP occurrence. This would result in faster average RT for RR and AR data as the number of REPs increased (Figure 2).

This modified hypothesis suffers by its inability to explain alternation data. More damaging, however, is the relationship between changes in guessing behavior and changes in RT as the probability of repetition occurrence increases, as the following data disclose. The group means for RR data were the following: 20 percent, 492 msec; 40 percent, 457 msec; 60 percent, 445 msec; 80 percent, 376 msec. The group means for AR data were as follows: 20 percent, 622 msec; 40 percent, 574 msec; 60 percent, 573 msec; 80 percent, 528 msec. The percentage of trials on which *S*s as a group guessed repetitions is indicated in parentheses: 20 percent (21 percent); 60 percent (69 percent); 40 percent (25 percent); 80 percent (71 percent). It is noted that the least change for RT for a transition from one condition to another is for the 40 to 60 percent transition; for RR the RT difference for this transition is —12 msec, and for AR it is —1 msec. Yet, it is for this very transition that the greatest change occurs in the guessing behavior of the *S*s. In contrast the greatest change in RT is for the 60 to 80 percent transition and it is precisely for this transition that the change in guessing behavior was least! These findings are exactly opposite to what the hypothesis would predict.

The above hypotheses were predicated on the assumption that the preparation is a single specific process. This viewpoint has been traditional in psychology. Woodworth (8) notes that both Exner and Cattell viewed preparation as a set of the nervous system and that as early as 1888 Lange investigated the difference in the effect of motor *vs.* sensory preparation on RT. As noted previously, Falmange speaks of "preparations" and "nonpreparations" and the introduction of guessing into the RT procedure was based on the rationale that a correct guess would lead to faster RT, since it would reflect *a* correct preparation.

In contrast to viewing preparation as a single specific process, psychologists conceive of RT as made up of the duration of a number of stages and in fact many recent experiments have been designed to elucidate these stages (6). The question arises whether a subject's preparation may be more complex than heretofore considered. Perhaps independent preparations occur at different stages.

The first finding, the "right-wrong" effect, is clearly a guess-dependent effect and can be interpreted in terms of a preparatory mechanism that is sensitive to subjective probability. In contrast the second result cannot be interpreted in terms of such a mechanism. The proposal is herewith made that a second preparatory mechanism exists that is dependent on objective probability. The suggestion that a subject's RT behavior may be influenced by more than one preparatory mechanism has also been made by Krinchik (5). In order for this proposal to be tenable its implications must be consistent with the following facts: (*a*) the dependence of repetition data (RR as well as AR) on objective probability, (*b*) the lack of such dependence for alternation data (AA as well as RA), and (*c*) the crossover of the AA and RR curves (as well as the RA and AR curves.)

All of these findings may be explained if one makes a few plausible assumptions and considers the implications of the proposed second preparatory mechanism.

To begin with, it is assumed that the mechanism can effect one of two kinds of preparation that respectively permit one of the two coded signals to get through or, stated alternatively, an incorrect preparation must be corrected before the signal may pass. The implications of the proposal do not depend on the nature of the preparation; however, in order to facilitate discussion an analogy will be used—that of a switch that can be in one of two positions. Following through with this analogy, one can say that if the switch is in the wrong position there must be a "switch" (in position) before the signal can pass; and it is assumed that a "switch" takes time. The further parsimonious assumption is made that in an extreme probability condition (such as 80 percent REP or 80 percent ALT) the mechanism effects the same position, respectively, on every trial.

Let us apply this model to those trials in the 80 percent REP and 80 percent ALT conditions, respectively, on which *the more probable event* occurs, using the following codes: (*a*) R-80R—a repetition is presented in the 80 percent REP condition; and (*b*) A-80A—an alternation is presented in the 80 percent ALT condition.

In the 80 percent REP condition the probability of a REP is high and, in accordance with the model, the mechanism would effect a preparation for a REP. However, since the required position is the same as that which permitted the coded signal on the prior trial to get through, no switch in position is necessary. A REP does in fact occur (only R-80R trials are being considered), so that the coded signals get through without any "switch" being required. In contrast, in the 80 percent ALT condition, the preparation for an alternation requires a switch in position from the correct position on the prior trial. The "switch" requires time. An ALT is in fact presented so that the coded stimulus is transmitted without any additional switching being required. Therefore, the transmission of an A-80A event requires one "switch," whereas a R-20R event requires zero "switches." The implication —for comparable 80 percent conditions, AA events should produce longer latencies than RR events—is consistent with the data (Figure 4).

The same kind of analysis will be applied to the following events: (*a*) R-20R—a repetition is presented in the 20 percent REP condition; and (*b*) A-20A—an alternation is presented in the 20 percent ALT condition.

In the 20 percent REP condition the most likely event is an ALT, so the mechanism would effect a preparation for an ALT. This requires a "switch" from the correct position on the prior trial. But a REP occurs that requires a second "switch" before the coded signal can be transmitted. In contrast, only one "switch" is required for an A-20A event. Initially, the required preparation is for a REP (as the probability of a REP is high in the 20 percent ALT condition) that requires no switching from the correct position on the prior trial. An ALT is presented that demands a "switch" before the coded signal may be transmitted. Accordingly, the transmission of a R-20R event requires two "switches," whereas an A-20A event requires one "switch." The implication—for comparable 20 percent conditions, AA events should produce shorter latencies than RR events—is consistent with the data (Figure 4).

In recapitulation: the model predicts that in comparable 20 percent conditions a REP will take longer than an ALT, since two "switches" are required for the REP, whereas only one "switch" is required for the ALT. In contrast, in comparable 80 percent conditions a REP will take less time than an ALT, since no "switches" are required for the REP, whereas one "switch" is required for the ALT. The crossover effect is thus explained. It is also possible to explain reasonably the apparent dependence of REP events on objective probability of occurrence of repetitions (the transition from the 20 percent to the 80 percent condition involves going from two "switches" to zero "switches"), as well as the lack of such dependence for ALT events (in both the 20 and 80 percent conditions only one "switch" is required.) Although the bulk of the discussion has centered around the influence of the second preparatory mechanism, sight should not be lost of the influence of the first preparatory mechanism (the "right-wrong" effect). What has been assumed is that the two effects are additive. The data clearly indicate a "right-wrong" effect (Figures 2 and 3). In our discussion we have considered the situation where this effect is held constant (RR *vs.* AA data or AR *vs.* RA data).

Although the implications of the model are consistent with the three major facts mentioned above, two questions arise in regard to its adequacy:

1. Why is there little difference in RT between comparable 40 and 60 percent REP conditions? There is a 12-msec difference between these conditions for RR data and one-msec difference between these conditions for AR data. Neither of these differences is significant.

Implicit in the discussion of the "objective probability mechanism" (the second preparatory mechanism) was that it operated by maximizing: that is, by always ordering the preparation for the stimulus that had the highest probability of occurrence. Although it is not unreasonable to suggest that this occurs at extreme probability values as in 20 percent and 80 percent REP conditions, it is not clear as to how it might operate at intermediate probability values as in 40 percent and 60 percent REP conditions. It is of interest to note that the RT values for the 40 and 60 percent conditions are approximately intermediate between RT for the 20 and 80 percent conditions. In fact the difference between RT for the 20 percent condition and the average of RT for the 40 and 60 percent conditions combined was not significantly different from the difference between these combined conditions and RT for the 80 percent condition [Scheffe's test for *a posteriori* comparisons as described in Ferguson (2, p. 297)]. The intermediate RT values for the 40 and 60 percent conditions are what one might expect if there was, on the average, a single "switch," which would result, in accordance with the model, if half of the preparations were for REPs and the other half for ALTs. If the ability of the mechanism to maximize depended on the length of history of prior trials, then one might expect that a longer history would be required for 40 and 60 percent conditions than for 20 and 80 percent conditions. A replication of the experiment for 40 and 60 percent REP conditions, in which number of trials was a parameter, would provide an experimental test of this possibility, the prediction being that the difference in RT for REPs between 60 and 40 percent REP conditions would increase as the number of trials increased.

2. Should the single "switch" necessary for transmission of an A-80A event add to RT to the same extent as the single "switch" necessary for transmission of an A-20A event? The model predicts that RT for ALTs in the 20 and 80 percent ALT conditions would be the same, as the event in each of these conditions requires a single "switch." However, the reason a "switch" is necessary differs in the two conditions. In the 80 percent ALT condition the "switch" is required for the initial preparation; since the ALT is the predominant event, a "switch" from the position that was correct on the prior trial is ordered. In contrast, in the 20 percent ALT condition, no "switch" is necessary initially; the predominant event is a REP so that the position required is the same as the correct position on the prior trial. The switch in this condition becomes necessary when the coded signal—an ALT—arrives and cannot be transmitted. One can question whether a "switch" in the 80 percent ALT condition should add at all to RT, since it would be possible for the "switch" to be completed before a stimulus is presented. If, on the other hand, one assumes a preparation cannot be ordered until some information about the stimulus is in the nervous system, the question becomes less disturbing. This last assumption becomes somewhat feasible when one recalls that the effects attributed to the second preparatory mechanism are independent of the subject's guess, which suggests that ongoing behavior prior to stimulus presentation does not affect its operation. Even so, one might expect the "switch" in the 20 percent ALT condition to add more to RT, since it presumably is not initiated until the signal has arrived at a given locus and is impeded because of an improper preparation. It is noted that the average RT for the 20 percent condition is longer (Fig-

ure 3) than for the 80 percent condition both for AA and RA data respectively.

The model proposed herein to explain the main effects of this experiment is in some ways similar to a proposal by Krinchik (5) to explain "the influence of signal probability on RT." Both proposals postulate the existence of two mechanisms dependent on subjective and objective probability, respectively. The subjective-probability dependent mechanism proposed herein to explain the "right-wrong" effect is indistinguishable from what Krinchik calls a "psychological" mechanism. The existence of such a mechanism has been suspected for some time and, as has been noted, provided the rationale for introducing guessing into the RT procedure. On the other hand what was apparently not suspected was the existence of a *second* mechanism. Krinchik's "physiological" mechanism differs from the objective-probability dependent mechanism proposed herein inasmuch as it does not appear to allow for immediate readjustments and is apparently conceived of as being some kind of physiological state, as indicated by the following description: "One of these mechanisms (which we shall call 'physiological') changes the level of the physiological reactivity of the sensorimotor system with regard to the objectively given regime of presenting signals owing to sensibilitation and facilitation" (5, p. 28). It is more than passing interest to point out that different kinds of RT experiments led Krinchik and the present author to the conclusion that it was necessary to propose two mechanisms, dependent on objective and subjective probability, respectively, to explain observed RT data.

D. SUMMARY

The effect of right and wrong guesses on two-choice RT was investigated under the following conditions: 20 percent, 40 percent, 60 percent, 80 percent repetitions. It was found that RT following right guesses, for repetitions and alternations respectively, was faster than RT following wrong guesses under all conditions, thus extending this previously reported finding from the single conditions in which repetitions occurred 50 percent of the time. It was further found that RT to repetitions, for right and wrong guesses respectively, varied indirectly as a function of the objective probability of repetition occurrence; whereas RT to alternations, for right and wrong guesses respectively, was relatively independent of this parameter. A model to explain this latter result, as well as the crossover of the two "right guess" and "wrong guess" functions respectively was examined. It was proposed that RT under the conditions investigated reflects the additive effects

of two independent preparatory mechanisms, one dependent on subjective probability and the other on objective probability.

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DETECTION OF VIBROTACTILE SIGNALS DIFFERING IN PROBABILITY OF OCCURRENCE*[1]

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A. INTRODUCTION

In the conventional signal-detection situation *S* is required to detect signals of a particular strength over a series of observation intervals, some of which contain a signal and some of which do not. The Theory of Signal Detection (TSD), which rejects the threshold concept in favor of the concept of an adjustable decision criterion, has been found to provide a highly accurate conceptual framework for explanation of the detection behavior obtained in situations of this type (e.g., 2, 4). In an attempt to extend the generality of TSD to a more complex detection situation, Gescheider, Wright, Weber, Kirchner, and Milligan (1) employed a task in which *S* was required to judge the presence or absence of signals of many different intensities presented with *equal* probability over a series of observation intervals. The detection probability data obtained in this experiment were in full agreement with the assumptions of TSD.

The purpose of the present experiment was to determine whether TSD can account for the detection behavior obtained in an even more complex detection situation than that described in the previous study (1). The detection task employed in the present study required *S* to judge the presence or absence of signals of many different intensities presented with *unequal* probability over a series of observation intervals. The present task was considered to be more similar than the previous task (1) to the type of detection task found in many applied situations, such as the monitoring of radar scopes and other display devices. In detection situations of this type, signals of different intensities and different probabilities typically occur within a single monitoring session. The demonstrated applicability of TSD to a detection situation of this type would not only have important implications for detection theory but

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would also permit TSD to influence the design of displays and other accessory equipment employed in many applied detection tasks.

B. METHOD

1. *Subjects*

Two male undergraduate students at Hamilton College served as *Ss*. Neither *S* had previously participated in psychophysical experiments.

2. *Apparatus*

The 60-Hz sinusoidal output of an oscillator (Hewlett-Packard model 200 AB) was applied to an electronic switch (Grason-Stadler model 829C) in order to obtain a signal of fixed duration with a rise-and-decay time of 25 msec. The electronic switch was triggered to present a 500-msec signal every 10 sec. The output of the electronic switch, after passing through a decade attenuator box (Hewlett-Packard model 350D) and an impedance matching transformer, was applied to a Goodmans V-47 vibrator. In a small test room *S* sat with his right index fingertip in contact with the vibrator. The pressure exerted on the skin by the vibrator contactor, which was ¼ inch in diameter, was maintained at a constant value of 30 gm by counterweighting the shaft on which the vibrator was mounted. A white light mounted at eye level served as a ready signal and was energized for 100 msec 1 sec before the onset of the 500-msec observation interval, which was designated to *S* by the simultaneous presentation of a 500-msec weak blue light. After each judgment *S* was provided with knowledge of results by activation of either a signal light or a no-signal light for approximately 1 sec.

3. *Procedure*

The *S*'s task was to judge whether or not a tactile stimulus was present during the observation interval and to rate the confidence of his judgment on a five-point scale. He was instructed to report "one" if very sure there was no signal, "two" if fairly sure there was no signal, "three" if not sure, "four" if fairly sure there was a signal, and "five" if very sure there was a signal. During a session, signals with peak-to-peak amplitudes of .00, 1.12, 1.40, 1.75, 2.20, 2.78, 3.49, and 4.40 microns were presented in random order. The *S* was told that in some sessions there would be about twice as many low-intensity stimuli as high-intensity stimuli (Condition L) and that in other sessions there would be about twice as many high-intensity stimuli as low-intensity sitmuli (Condition H), but that the overall probability of sig-

TABLE 1
NUMBER OF TRIALS PER SESSION FOR EACH SIGNAL STRENGTH UNDER THE L AND H CONDITIONS

Condition	Signal strength .00	1.12	1.40	1.75	2.20	2.78	3.49	4.40
L	40	24	24	24	10	10	10	10
H	40	10	10	10	10	24	24	24

nal occurrence would be the same in every session. The order of the H and L sessions was counterbalanced over a series of 16 sessions, and *S* was told which condition would occur in each session. Table 1 shows the number of signal presentations in a session at each intensity level under the L and H conditions. Although the probability of occurrence of the three weakest signals and the three strongest signals was different under the two conditions, the overall probability of signal occurrence was the same under the two conditions (i.e., .74). Under the L condition the probability that one of the three weakest signals would be presented was .47, while the probability that one of the three strongest signals would be presented was only .20. Under the H condition the probability was .20 that one of the three weakest signals would be presented and .47 that one of the three strongest signals would be presented.

C. RESULTS AND DISCUSSION

Presented in Figure 1 for the L and H conditions is the probability of reporting a signal, expressed in *z* scores, as a function of signal amplitude. Although the overall probability of signal occurrence was exactly the same under the two conditions (Table 1), inspection of Figure 1 reveals that the percentages of signal-present decisions were uniformly higher under Condition L, where signal probability was greater for the three weaker signals, than under Condition H, where signal probability was greater for the three stronger signals.

It is proposed in TSD that *S* sets the location of his decision criterion in such a way that his signal-present—signal-absent decision performance is maximized. The data of the present study are consistent with this hypothesis and can be accounted for readily if it is assumed that *S* set his decision criterion at a lower point on the sensory continuum under Condition L than under Condition H. Presented in Table 2 are the proportions of hits and false alarms under the L and H conditions. The higher false alarm rate and the higher hit rate for both weak and strong signals under Condition L constitute

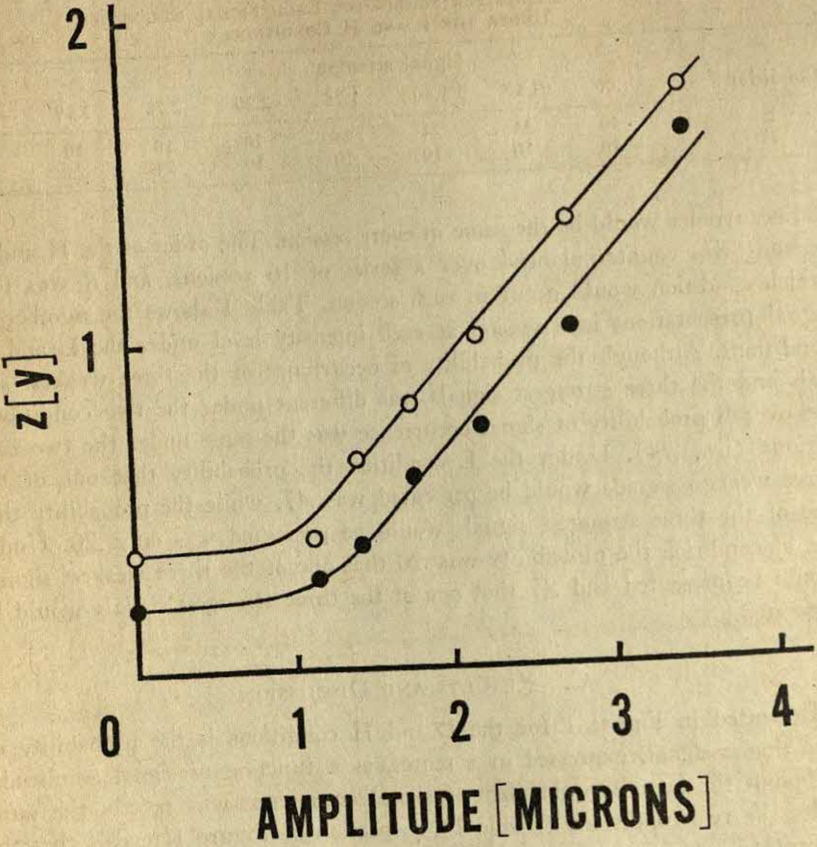

FIGURE 1
PROBABILITY OF DETECTION EXPRESSED IN z SCORES AS A FUNCTION OF VIBRATION AMPLITUDE FOR CONDITION L (OPEN POINTS) AND CONDITION H (FILLED POINTS)

strong evidence that *S* set his criterion at a lower point on the sensory continuum under Condition L than under Condition H. Under Condition L, *S* appears to have accepted the higher false alarm rate accompanying the adoption of a lower criterion in order to increase the likelihood of detecting the more frequently occurring weak signals. Under Condition H, on the other hand, the detection of weak signals was not as essential to overall performance because of the less frequent occurrence of these signals. As a result, *S* was able to set a higher criterion and thus reduce his false alarm rate without ap-

TABLE 2
PROPORTIONS OF SIGNAL-PRESENT DECISIONS

Condition	False alarms	Weak-signal hits	Strong-signal hits
L	.64	.73	.95
H	.56	.66	.92

preciably reducing his detection of the more frequently occurring strong signals (see Table 2).

If the relative frequency of presenting signals of different strengths affects detection probability by changing the location of *S*'s criterion, rather than by changing his sensitivity, then *d′*, a measure of sensitivity in TSD, should be unaffected by this variable. The value of *d′* for each signal strength was calculated from the proportions of hits and false alarms. In Figure 2 it is seen that *d′* increases as a linear function of signal amplitude but is essentially the same for the L condition (open points) as for the H condition (filled points).

The analysis of detection probabilities in terms of changes in the location of a judgment criterion and/or changes in stimulus detectability (i.e., *d′*) is predicated upon the assumption that the basic premises of TSD are correct for vibrotactile stimulation. One technique for testing the applicability of TSD to a detection situation is to examine the shape of the function in which the proportion of hits is plotted against the proportion of false alarms (i.e., the ROC curve). The data obtained by the rating procedure can be used to construct ROC curves. Each of the five categories was regarded as a different criterion, and the proportion of hits (Py/SN) and the proportion of false alarms (Py/N) were computed for each of the five criteria (see 2). The ROC curves generated from the rating-scale data are plotted in Figure 3 for all but the weakest and strongest signals employed in the experiment. The data from Condition L (open points) and Condition H (filled points) for a particular signal strength fall on the same ROC curve in every case. This finding provides further support for the hypothesis that changing the relative frequency of signals of different strengths affects the location of *S*'s criterion but not signal detectability. The curvilinear symmetrical form of the curves clearly conforms to the predictions of TSD. When plotted on probability coordinates, the functions are linear with slopes approximating 1.0. The linearity of the functions indicates that the noise (N) and signal-plus-noise (SN) distributions were normal in form, and the slope of 1.0 indicates that the variance of the N and SN distributions was approximately the same. Under these conditions, *d′* can be used as a valid measure of signal detectability. These results are consistent with those of Swets, Markowitz, and Fran-

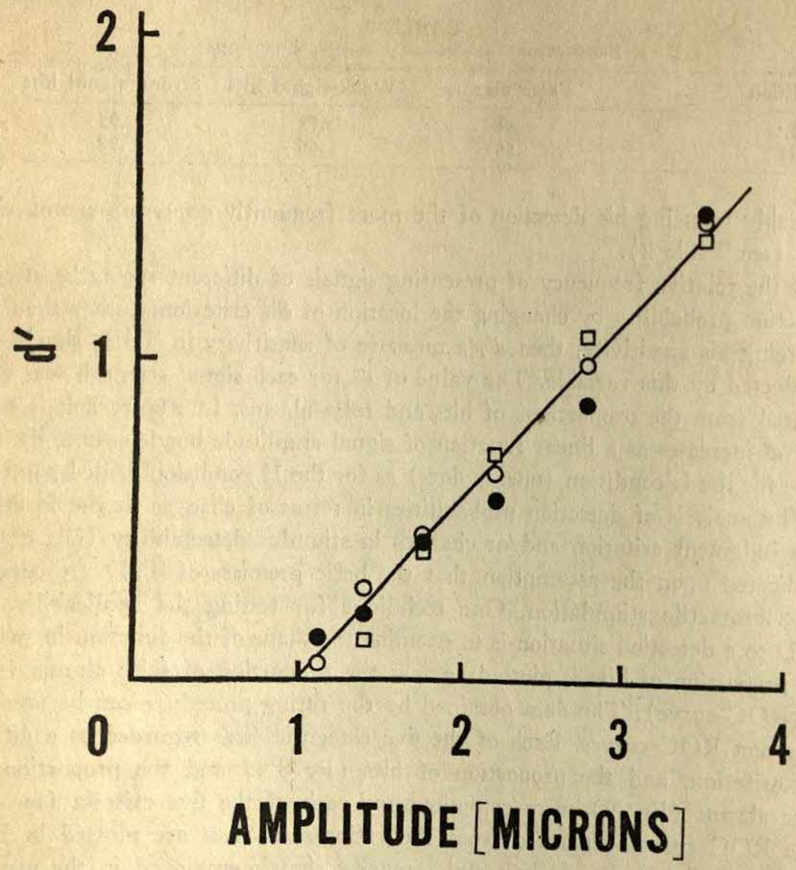

FIGURE 2
THE RELATIONSHIP BETWEEN *d'* AND VIBRATION AMPLITUDE FOR CONDITION L (OPEN POINTS), CONDITION H (FILLED POINTS), AND RATING DATA (OPEN SQUARES)

zen (3), who also found that ROC curves for vibrotactile signals conformed closely to the predictions of TSD.

The results of the present experiment indicate that *d'* remains invariant when the decision criterion is changed by changing the relative frequencies of occurrence of signals of different strengths. The validity of the detection theory analysis of the present data is supported by the form of the ROC curves derived from the rating-scale data. This analysis passes an even more rigorous test if the value of *d'* for a given signal strength is independent of the particular method used to obtain the *d'* values. The squares plotted in

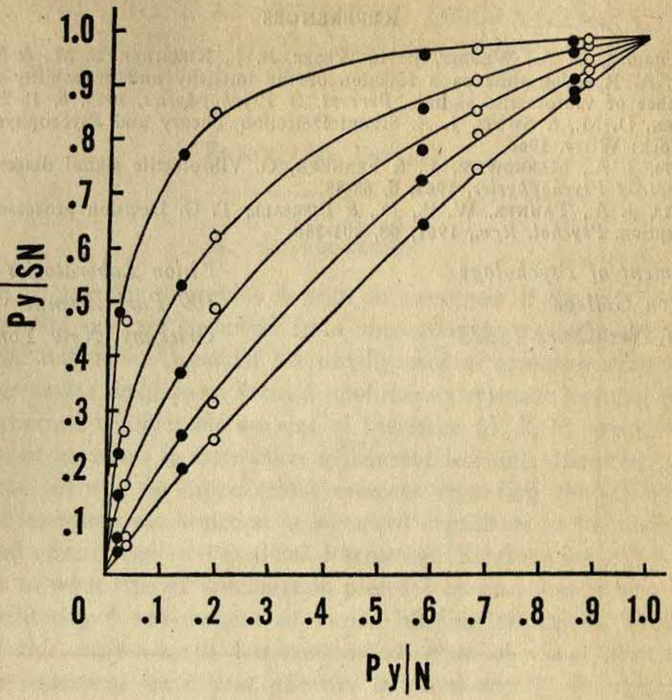

FIGURE 3
ROC Curves Derived from Rating Data

Figure 2 represent the *d′* values derived from the ROC curves presented in Figure 3. These values are seen to correspond closely to the *d′* values computed from the yes-no data plotted in Figure 1.

D. Summary

Two *S*s were required to report the presence or absence of brief 60-Hz vibrotactile signals applied to the index fingertip. The probability of signal occurrence was .74 in every session, but the relative frequency of occurrence of weak and strong signals was different in different sessions. When weak signals were presented more frequently than strong signals, the proportion of signal-present decisions was higher than when strong signals were presented more frequently than weak signals. Analysis of the false alarm and hit rates indicated that the effects of this variable on detection performance were attributable to a shift in the location of *S*'s judgment criterion, rather than to changes in signal detectability.

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QUESTIONS AS ADVANCED ORGANIZERS IN VISUALIZED INSTRUCTION*

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A. Introduction

The use of questions to provide Ss with an awareness of the type of information they are expected to obtain from instruction is becoming a common instructional technique. Questions are usually used as orienting stimuli (advanced organizers) designed to focus *S* attention on relevant learning cues in the instruction. A considerable amount of literature (1, 2, 3) exists regarding the use of questions in instruction to improve learning. However, at the present time there is no experimental evidence regarding the effectiveness with which questions can function as advanced organizers in improving the instructional effectiveness of visualized instruction. Furthermore, there is no evidence as to what type of visualization preceded by questions is most effective in facilitating *S* achievement of varied learning objectives. Thus, the purpose of this study was to determine which types of visual illustrations preceded by questions were most effective in promoting *S* achievement on five criterial measures, when *S*s were permitted to interact with their instructional unit for as long as they felt necessary to comprehend the information being presented.

B. Method

1. *Arrangements*

Each of 266 *S*s at The Pennsylvania State University was randomly assigned to one of nine treatment groups. *S*s in each treatment group received their instruction in regular textbook-like booklets consisting of 37 pages each. Each illustrated page contained a 2½-inch by 3½-inch illustration designed to complement and illustrate the printed content material and was preceded by a page containing a question designed to focus *S* attention on the relevant learning cues.

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2. *Procedure*

Information presented via the printed channel was held constant for each presentation, and the amount of realistic detail contained within the visual illustrations was varied. *S*s in Group I received no visual illustrations, but viewed printed words depicting the concepts discussed. Group II viewed simple line illustrations (black and white); Group III, simple line illustrations (colored); Group IV, detailed, shaded drawings (black and white); Group V, detailed, shaded drawings (colored); Group VI, photographs of a heart model (black and white); Group VII, photographs of a heart model (colored); Group VIII, realistic heart photographs (colored). *S*s were asked to indicate on their booklets the amount of time it took them to complete their instruction.

3. *Criterial Measures*

Each *S* received the Otis Quick-Scoring Mental Ability Test as a pretest, participated in his respective instructional presentation, and then received four individual criterial tests. Scores received on these tests were combined into a 78-item total criterial test. The objective of each test was as follows: (*a*) the drawing test evaluated *S*'s learning of specific locations of the parts of the heart; (*b*) an identification test measured *S*'s ability to identify numbered parts of a diagram of the heart from information received in the instruction; (*c*) a terminology test evaluated knowledge of referents for specific symbols; (*d*) a comprehension test measured understanding of the heart, its parts, and its internal operations; and (*e*) the total criterial test measured *S*'s total understanding of the concepts presented. The Kuder-Richardson Formula 20 reliability coefficients for the five criterial measures were (*a*) drawing, .86; (*b*) identification, .75; (*c*) terminology, .77; (*d*) comprehension, .73; and (*e*) total criterial, .92.

C. RESULTS AND DISCUSSION

An analysis of variance was conducted on the *IQ* scores that *S*s achieved on the Otis Mental Ability Test and on the amount of time that *S*s in the respective treatment groups needed to proceed through their instructional unit. In no case did the observed values reach the critical value for a .05 level test. Of the five criterial measures used in this study, an analysis of variance indicated that a significant F ratio existed only for the drawing test ($F = 4.62$, $df = 8/257$, $p < .01$). Tukey's W-Procedure (4) was used to analyze differences between pairs of means. The analysis indicated that, in terms of economy of production and instructional effectiveness, the simple line presentation (black and white) was most efficient in facilitating *S* achievement of those objectives measured by the drawing test (II > I, $W = 4.38$, $n/v = 9/266$, $p < .01$).

The results indicate that the use of questions as advanced organizers to focus *S* attention on relevant learning cues is not an important instructional technique for increasing *S* achievement of all types of learning objectives. Furthermore, all types of visual stimuli used to complement and illustrate printed instruction are not equally effective in facilitating *S* achievement. The success of the simple line illustrations (black and white) may be attributed to the fact that *Ss* could readily identify the relevant instructional cues in the visuals and learn from them. It may be that even though the *Ss* knew the type of information to look for in the realistic illustrations, the additional detail contained in them had the tendency to distract attention from the essential learning cues. The failure of the visually complemented treatments to facilitate achievement on the identification, terminology, comprehension, and total criterial tests may be explained by the fact that questions preceding the content material and focusing *S* attention on relevant learning cues enabled *Ss* to obtain the necessary information from the printed material alone. It may also be that for the achievement of educational objectives of the type measured by these tests, visualization is superfluous.

D. SUMMARY

The purpose of this study was to measure the effectiveness with which questions function as advance organizers in complementing visualized instruction. Questions preceded each visualized page in the instructional booklets and were designed to direct *S* attention to relevant learning cues. Each *S* received a pretest, participated in his respective visualized presentation, and received four individual criterial measures. Analyses indicated that (*a*) the use of questions as advance organizers in visual instruction is not an effective instructional technique for increasing *S* achievement of different types of learning objectives and (*b*) different types of visuals, when preceded by questions, are not equally effective in facilitating *S* achievement.

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NONVERBAL RIGIDITY AND SEVERITY OF CRIMINAL OFFENSE IN A GROUP OF JUVENILE DELINQUENTS*[1]

New York State Psychiatric Institute[2] *and Essex County Probation Department*

STEPHEN BRESKIN AND PHILIP G. BURCHILL

A. INTRODUCTION

One striking feature of delinquent and criminal offenders in general is their propensity to recommit their crimes. Lamott (6), in evaluating recidivism at San Quentin, observed that the young delinquent finds his only social structure and acceptance within prison walls and frequently "messes up" his opportunity for early release, or even repeats his petty crime patterns on the outside world, in order to insure his return to custody. This form of behavior pattern has also been documented in psychoanalytic literature. Freud (3) noted that there were some patients who would continually repeat behavior patterns long after the behavior was appropriate. This mechanism was termed "repetition compulsion" and was most clearly typified in the symptom formation of the anal-compulsive personality. The extent to which the repetition compulsion was rigidly adhered to indicated the degree of severity of the symptom. More recent work (5, 7) has maintained that rigidity is a definite indicator of psychopathology. A review of the literature reveals that the variable of rigidity has not been explored in connection with juvenile delinquency.

Breskin (1) has devised a nonverbal measure of rigidity (the BRT), which is unrelated to intelligence (2) and negatively correlated with creativity and problem-solving ability (4). In the present study, we expect that the severity of criminal offense committed by a group of juvenile delinquents will be positively related to nonverbal rigidity (as measured by the BRT).

B. METHOD

1. *Subjects*

*S*s were 100 male juvenile delinquents who were on probation at the Essex County Probation Department. The *S*s ranged in age from 12 to 19 years, with a mean of 15.61 years and a standard deviation of 1.66 years.

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[1] The authors wish to express thanks to Dr. Richard W. Firestone for his helpful comments.

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2. *Procedure*

*S*s were given the BRT with standard instructions (1) during a routine meeting with their probation officer. The BRT requires *S* to state which of a pair of two visual stimuli he likes better. Each stimulus of a pair differs from the other stimulus so that one figure represents a good gestalt (scored 1 if chosen), while the other figure does not (scored zero if chosen). There are 15 such pairs of stimuli, and a score of 15 is the maximum rigidity score, while a score of zero is the minimum.

In order to assess the severity of criminal offense, the records of each *S* were examined. Two measures were obtained: (*a*) the nature of the criminal act—i.e., records were scored as to crimes committed against a person (e.g., physical assault), crimes committed against property (e.g., theft), and crimes of endangering health and welfare (e.g., carrying a weapon); (*b*) repetition of the criminal act—i.e., records were scored as to first *versus* latter offense. Crimes against people which were a latter offense were taken as the most severe. It is to be noted that four of the 100 juvenile delinquents could not be classified in the above scheme, and, therefore, the results report data on 96 *S*s.

C. RESULTS AND DISCUSSION

For the 96 *S*s, there were 34 criminal acts against people, 50 against property, and 12 of endangering health and welfare. Of these crimes, 52 were committed by first offenders and 44 were recidivists. Table 1 shows the BRT scores for crimes against people *versus* other crimes and for latter *versus* first offense. As expected, juveniles committing crimes against persons had higher BRT scores than those who did not ($p < .025$), and latter offenders had higher BRT scores than first offenders ($p < .10$). The category of "other crimes" in Table 1 represents the combination of crimes against property

TABLE 1
BRT SCORES FOR EACH CLASSIFICATION OF CRIMINAL OFFENSE

Crimes against people ($n = 34$)		Other crimes ($n = 62$)			Latter offense ($n = 44$)		First offense ($n = 52$)		
M	*SD*	*M*	*SD*	*t*	*M*	*SD*	*M*	*SD*	*t*
8.97	2.82	7.66	2.66	1.99[a]*	8.60	2.88	7.73	3.70	1.29[a]*

Note: All tests are one-tailed.
[a] F_{max} test nonsignificant at $p < .05$.
* $p < .025$.
** $p < .10$.

(mean BRT = 7.92) and crimes of endangering health and welfare (mean BRT = 6.58). These were combined because of the small number of *S*s in the latter category. The above results, taken together, suggest that the variable of rigidity may have some connection with certain patterns in juvenile delinquency.

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INFANT REACTIVITY TO REDUNDANT PROPRIOCEPTIVE AND AUDITORY STIMULATION: A TWIN STUDY*[1]

Educational Testing Service

LELAND D. VAN DEN DAELE[2]

A. INTRODUCTION

When an infant is rocked, his state changes from greater to lesser activity and his mood from distress to relative quiescence. This effect, designated the rockerbox effect, appears largely independent of sex, age, maternal presence or absence, or parental practices related to previous rocking experience (15). Decrement of pretreatment activity, however, varies with rocker rate (4, 15) as well as initial state (15).

Redundant sound is another class of stimulation with similar consequences for infant behavior. Exposure to continuous or intermittent sound reduces infant activity more than no sound at all (1, 13, 16). This effect, like the rockerbox effect, appears independent of reinforcement history or pretreatment experience associated with sound (2, 12). Both effects implicate an unlearned response or at least a dispositional tendency to respond in a characteristic way to redundant stimulation.[3]

One test of this implication is a behavior genetic analysis (8). Twin designs, which compare the relative differences between monozygotic and dizygotic pairs, provide a simultaneous control for age and generational factors which often confound developmental evaluation (10). When twins are selected from intact families, a rigorous match is obtained for the general factors that relate to health care and nutrition, availability of stimulation, and maternal care and social interaction. Differences in behavioral variability between fraternal and identical twins may be imputed to dispositional differences, or, at least, dispositional differences that interact with antecedent ex-

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[2] On leave from the University of Illinois. At present, special USPHS Fellow.

[3] Redundancy describes a parameter of information transmission. A completely repetitive signal supplies no new information and, in this sense, is analogous to a completely noisy channel with no code transmission. In both cases, relative entropy is zero.

perience. The method provides positive presumptive evidence for the role of endogenous factors in behavioral regulation.

B. METHOD

1. *Subjects*

*S*s were six same-sex identical and three same-sex fraternal twin sets. The twins ranged in age from 6 weeks to 24 weeks with a median age of 18 weeks for identical twins and 20 weeks for fraternal twins. Although two identical and two fraternal twin pairs were premature, all *S*s were free from overt morphological or anatomical anomalies. Diagnosis of zygosity was obtained through chorional and seriological examination, and, when these data were unavailable, dermatoglyphic and physical concordance (9).

2. *Apparatus*

A 32-inch-square, motor-driven rockerbox was divided into two equal compartments by a 14-inch-high partition. The rockerbox was adjusted to oscillate in a head-to-foot direction with a displacement of three inches at either 30 or 60 cycles per minute. An 80 db white noise source was placed 30 inches horizontally to the longitudinal axis of the rockerbox.

3. *Procedure*

In a previous study, the rockerbox effect was exaggerated with irritable infants (15). Since irritability is more pronounced when infants are hungry (18), mothers were instructed not to feed their twins for at least two hours prior to treatment. Two mothers, one of an identical pair and one of a fraternal pair, did not comply, but the infants were in a wakeful state.

One member of each twin set was placed on each side of the partition. Four treatments were administered in a mixed order. The treatments were combinations of slow and fast rocking under no sound and sound conditions. Each treatment was one minute in duration, preceded and followed by one minute pre- and posttreatment periods. The activity level of each twin was rated on a five-point scale at 30-second intervals by an observer out of the infants' visual field from the onset of the pretreatment to the conclusion of the posttreatment period. A rated response of one corresponded to inactive, sleeping; two, slightly active, drowsy; three, moderately active, alert, seeking; four, very active, grasping, restless; five, highly active, gross body movement, thrashing (14). Interrater reliability for a similar task with the same scale was .86 between two independent observers for 768 paired observations (15) and, in the present study, .90 for 52 paired observations.

C. Analysis 1: Group Treatment Effects

1. *Results*

A four factor ANOVA was calculated to evaluate the main effects and interactions of treatment combinations. Factor A, auditory stimulation, included two levels, no sound and sound; and Factor B, proprioceptive stimulation, two levels, slow and fast rocking. Factor C, periods, was comprised of three intervals, the pretreatment, treatment, and posttreatment periods; and Factor D, trials within intervals, six consecutive ratings of activity level. Trials were nested within periods. Data for two *S*s for two and three treatments respectively were estimated. The former *S* was a member of a fraternal set, the latter a member of an identical set. After treatment these *S*s fell asleep and were not roused by a bell or manual manipulation. The degrees of freedom for significance tests were correspondingly reduced. Significance for treatment effects was set at or beyond the .01 level of confidence.

Two main effects and one interaction obtained significance for group data (Table 1). The proprioceptive treatment for all conditions had a marked effect on infant state (C effect), with infants less active when rocked. The group means for pretreatment, treatment, and posttreatment periods were 3.33, 2.02, and 2.85 respectively. After treatment, recovery in the direction of the previous state was gradual, with the group means for the fifth trial 2.66 and for the sixth trial 3.03 (D effect). Finally, treatments accompanied by sound were more quieting than treatments not accompanied by sound (AC interaction, Figure 1).

2. *Discussion*

The general effectiveness of the rockerbox treatment found in an earlier study (15) was replicated. Irritable infants became less active and more quiescent when rocked. The effect persisted into the posttreatment period with gradual recovery toward pretreatment levels. When pretreatment rat-

TABLE 1
ANOVA for Significant Treatment Effects

Source	*MS*	*df*	*F*	*p*
Between subjects	16.36	15		
Within subjects	1.33	368		
C	68.26	2	65.61	$<.001$
D	2.27	3	6.39	$<.01$
AC	1.81	2	5.11	$<.01$

Note: Error term was derived through computation of partitioned within-cell variation (17).

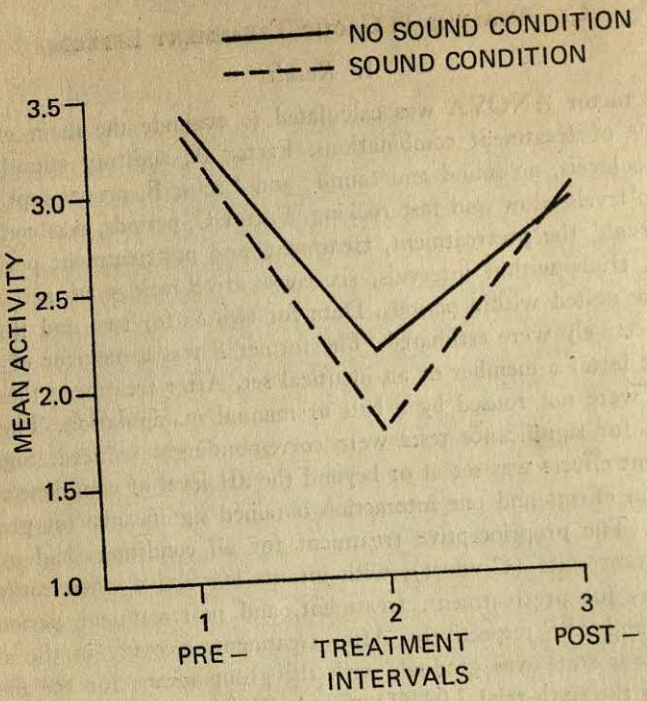

FIGURE 1
Mean Activity by Periods for Sound and No Sound Conditions

ings were divided at the scale median into high and low groups and difference scores between pre- and posttreatment state computed, infants initially above the scale median were significantly less active after treatment relative to initial state than infants below the scale median ($t = 2.98$, 51 *df*, $p <$ .01). The posttreatment payoff was larger with active infants.

White noise concomitant with rockerbox treatment depressed activity more than rockerbox treatment alone. This result is reminiscent of the additive effect of light and sound demonstrated by Irwin and his co-workers, summarized by Spears and Hohle (12) and, in another context, by Brackbill *et al.* (2). Prolonged redundant stimulation, independent of modality, decreases infant activity and attentional orientation (7, 11). One is tempted to postulate with Brazelton (3) some central nervous device which monitors certain general input parameters. When redundancy is sufficiently intense, and channel capacity limited, the signal-to-noise ratio decreases and sensory-behaviora contingencies obtain a potential instability. Since such instability is, by defini tion, disruptive of system organization and, in a general way, nonadaptive, it is not surprising that some damping device is engaged. The maternal practices of rocking, patting, stroking, cooing, singing, and feeding probably overdetermine infant quiescence through what appears a very general stimulus control mechanism. Redundancy, even redundant love, inhibits as well as soothes.

D. ANALYSIS 2: TWIN DIFFERENCES

1. *Results*

A five factor ANOVA of difference scores by trials between pairs of twins was computed. The first four factors, A through D, were the same as the factors in the preceding analysis. The fifth factor was twin zygosity with subjects classed as fraternal or identical. Significance for main effects and interactions was again set at or beyond the .01 level of confidence.

Four interactions obtained significance (Table 2). Differences between twins were either unchanged or somewhat smaller after slow treatments, but larger after fast treatments relative to initial state (BC interaction). The activity of fraternal twins diverged during the slow rocker treatments, particularly during the no sound conditon (ABCE interaction), and after fast rocker treatments (BCE interaction, Figure 2). Finally, difference scores for fraternal twins were more variable by trials to the various treatments (ABDE interaction, Figure 3).

TABLE 2
ANOVA FOR SIGNIFICANT DIFFERENCE SCORES

Source	*MS*	*df*	*F*	*p*
Between pairs	7.69	6		
Within pairs	.58	161		
BC	1.55	2	7.10	<.01
BCE	6.04	2	27.61	<.001
ABCE	.57	2	8.68	<.01
ABDE	2.09	3	17.83	<.001

Note: Error term was derived through computation of partitioned within-cell variation (17).

2. *Discussion*

Three of the four significant interactions involved behavioral divergence between fraternal and identical twins. In contrast to the behavioral consistency and stability of identical twins, fraternal twins were more divergent

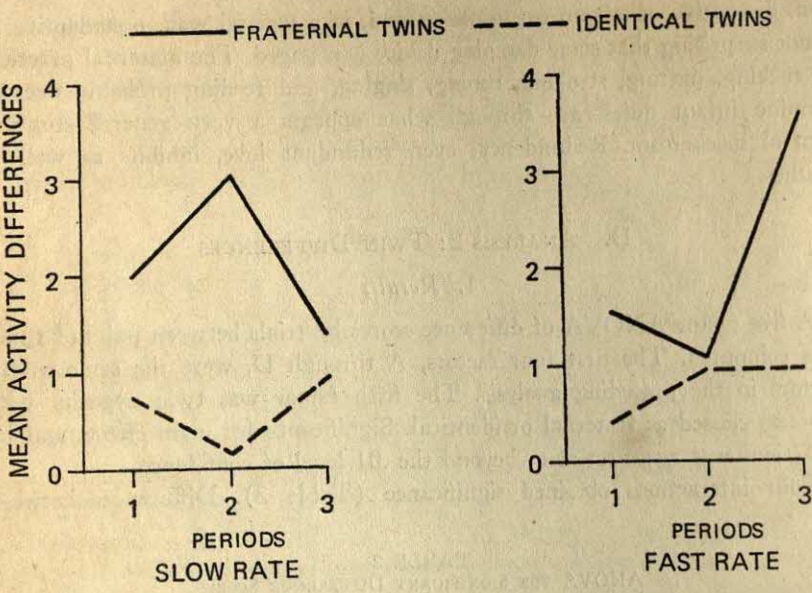

FIGURE 2
DIFFERENCE SCORES FOR IDENTICAL AND FRATERNAL TWINS BY PERIODS FOR SLOW AND FAST ROCKERBOX TREATMENTS

under all treatment conditions and markedly more variable in this divergence. In general, the behavior of fraternal twins was similar when redundant stimulation was sufficiently intense and divergent when insufficiently intense. Under all conditions of stimulation the behavior of identical twins remained similar.

Within the constraints imposed by a small *n* (characteristic of twin studies), these results implicate a constitutional contribution to infant response to redundant proprioceptive and auditory stimulation. Not only the general state obtained by the infant but also the pattern and duration of recovery appear intrinsically mediated. These action patterns are quite "molecular" insofar as they describe the simultaneous response of twin pairs within relatively brief time intervals. As suggested by Freedman (5, 6), the genetic basis of behavior appears to extend to specific reactions to specific stimuli.

E. SUMMARY

A review of the literature implies that redundant proprioceptive and auditory stimulation are associated with changes in infant state that appear biophysically linked and relatively independent of reinforcement history (2, 12,

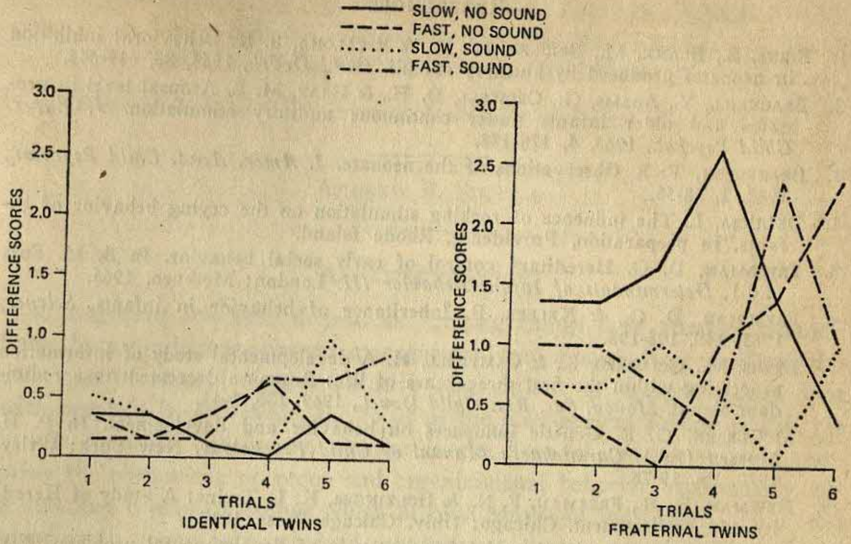

FIGURE 3

TREATMENTS BY TRIALS BY GROUPS

Fraternal twin pairs are not only less concordant for behavior than identical pairs but more variable from trial to trial.

15). In the present investigation, the concurrent behavior of three sets of fraternal twins and six sets of identical twins to four combinations of proprioceptive and auditory treatments was evaluated to provide evidence about the role of genetic factors in regulation of response to redundant stimulation. Group evaluation, without regard to zygosity, replicated the general effectiveness of proprioceptive stimulation and suggested the occurrence of a gradual recovery period after treatment. In general, recovery was less pronounced for initially more active infants. Moreover, continuous sound stimulation augmented the proprioceptive treatment. When difference scores between groups were evaluated for treatment combinations, identical twins obtained a marked behavioral consistency from pre- through posttreatment periods. Fraternal twins were significantly more divergent during the weaker, slow, no sound condition and after the stronger, fast conditions, as well as significantly more variable in behavior within periods, than were the identical twins. The results appear to provide positive evidence for the role of endogenous, genetically linked regulation of infant response to redundant stimulation.

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VALUES AND VALUE SYSTEMS: IMPORTANCE AND RELATIONSHIP TO MANAGERIAL AND ORGANIZATIONAL BEHAVIOR*

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A. INTRODUCTION

Management has been defined as "getting things done through people." Some human-relations-oriented management academicians have modified this definition because of its manipulative connotations to "getting things done with people." In any event, the focus of the management process is still the human element. The human element in the form of individual units comprises the phenomena of group and organizational behavior. Accordingly, organizations consist of groups which in turn consist of individuals. Thus, not surprisingly, many acknowledged management experts consider the study of individual human behavior to be the central issue in understanding all forms of managerial and organizational behavior. However, individual human behavior has been described and explained in almost an infinite number of ways. Underlying all descriptions and explanations is either an explicit or an implicit concept of motivation. Individual human motivation then appears to be the focal point in understanding managerial and organizational behavior.

B. DEFINITION OF MOTIVATION

The concept of motivation is difficult to define. The concept is difficult to comprehend for the layman, but, unfortunately, even the alleged and acknowledged experts in the field of behavioral science do not agree as to its meaning. Accordingly, there is no one set universally accepted definition of motivation. Many authors have attempted to clarify and define the concept. One author states that "motivation is the general name for the fact that an organism's acts are partly determined by its own nature or internal structure" (16, p. 99). Such a statement confines the concept of motivation to behavior caused by "internal" factors rather than "external" factors. Other authors have attempted to refine and define the concept of motivation further (20).

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Such authors explain that "internal" behavior can be either psychological or physiological and only the former properly belongs in the province of motivated behavior. Thus, such behavior as the beating of our hearts or salivary secretion is physiological and not to be properly considered as motivated behavior. Still other authors have attempted to restrict and define motivation in terms of only "need fulfilling behavior or activity" (14, p. 76). Thus, the concept of motivation is subject to semantic and definitional difficulties. Different authors define the concept in different ways depending upon the purposes for which the concept is being studied. In general, the academic orientation of any author influences the manner in which he will define and operationalize the concept of motivation. For our purposes, an intuitive grasp of the motivation concept is all that is necessary. In general, motivation will be discussed in its broadest concept: that is, utilizing the assumption that all behavior is motivated behavior. More specifically, much of the discussion to follow emphasizes only internal, psychological behavior.

C. THE NATURE OR CAUSES OF MOTIVATION

Many theories of motivation exist. Some current and popular attempts to explain motivated behavior have used such concepts as "needs," "drives," "tensions," "expectancy-values," "systems," *et cetera.* The "needs" approach claims that any and every individual has various needs. An individual allegedly acts or behaves in a fashion that will satisfy these needs. These needs are usually classified in a hierarchy similar to the following: physiological, safety, love-social, self-esteem, and self-actualization (13, 14). Under one theory, an individual initially attempts to satisfy basic needs (physiological, safety) after which he tries to fulfill higher level needs (self-esteem and self-actualization). Thus, "needs" allegedly can explain individual behavior. Other more specific theories claim that needs cause "drives" and it is really this drive which is at the heart of the explanation of human behavior (11, 12). Man supposedly attempts to eliminate or alleviate this drive and in so doing acts or behaves in a manner characteristic of human beings. Even more refined theories purport that these "drives" produce "tensions" which are actually the essential elements of motivated behavior (21).

As such theories continue from broad and general to narrow and specific, the final classification of motivation theories is the "expectancy-value" category (4). Common to all such theories is the notion that the strength of the tendency to act in a motivated manner is the product of the strength of expectancy that the act will be followed by a given consequence and the relative importance of that consequence to the individual (22). Some authors refer to the "value of the goal," the "demand for the goal," the "utility of the consequence," the "product of motive and incentive," *et cetera.*

Research examples of "needs," "drives," "tensions," and "expectancy-value" approaches to explain individual behavior are too common and too numerous to mention specifically. These approaches are the more popular attempts to explain individual behavior today. Those approaches examined thus far have been mentioned in order to give the reader some feeling for the current state of affairs in motivation theories. Other approaches and theories about behavior are also available but have not been mentioned here (4, 6, 11, 12).

D. THE SYSTEMS APPROACH TO EXPLAIN MOTIVATION

Partially as a reaction to specific and oversimplified concepts of human motivation, today many "systems" approaches are being theorized and advocated as explanations of individual behavior. Critics have argued that, in doing so, theories of behavior have regressed back into their broad, general stage.

Systems theories are gaining in popularity throughout the social sciences. Systems theories utilize systems analysis. Systems analysis. is a way of thinking. It is an attempt to arrive at a theoretical framework, a philosophical approach, and/or an analytical methodology from which one can attempt to explain some phenomenon, such as motivated behavior. Accordingly, a system can be defined as a set of many, complex, interrelated, viable and dynamic concepts, ideas, or variables whose purpose is to explain a phenomenon in an orderly fashion. Systems are normally composed of numerous subsystems which are smaller systems within larger systems. In addition, subsystems often overlap and possess feedback loop mechanisms.

The phenomenon in question remains: "What factors determine (or motivate) human behavior?" A simple systems model to answer this question might be the one indicated in Table 1.

Let it initially be recognized that any attempt to explain motivation or any

TABLE 1
SYSTEMS APPROACH: INDIVIDUAL BEHAVIOR DETERMINANTS

Individual behavior determinants	
Internal factors	External factors
Objectives (goals)	Governmental (political, legal)
Values	Social
Needs	Economic
Drives	Technological
Tensions	Spiritual-ethical

other concept in terms of a model or a system must by necessity be a drastic oversimplification. Models are merely attempts to represent or replicate reality. Any schematic representation of such an ongoing process as motivation or individual behavior can at best only hope to summarize and explain some of the major considerations involved.

If the above limitations of models and systems are kept in mind, motivated behavior can be envisioned as a system comprised of two major subsystems—internal factors and external factors—each of which contains five subsystems of its own. The number of subsystems in any model varies directly with the whims of the model builder. The author could just as easily have added other internal factors, such as aspirations, expectations, *et cetera;* or other external factors, such as geographical, cultural, *et cetera.* The more the number of subsystems, the easier to envision the interrelated and overlapping characteristics of systems analysis.

This model merely states that an individual's behavior is determined by many factors. For example, externally, one's behavior depends upon the "laws" governing the environment and/or the "social" implications of certain actions. Internally, one's "goals," "values," and "needs," *inter alia,* may influence one's behavior.

An acknowledged expert in the field of systems analysis once said after a systems lecture: "If at this point you are not entirely confused, I have failed to make myself clear!" It is not surprising to find that many individuals believe that systems analysis instills more confusion than insight. To envision motivated behavior as an output of many, overlapping, complex, interrelated, viable and dynamic variables is not particularly enlightening to most individuals.

E. The Values and Value Systems Approach To Explain Motivated Behavior

The main drawback of systems analysis is the lack of awareness of the proper priorities or weights that should be attached to the various elements comprising the system. Although the absolute number of interacting variables involved may be large, the number of key or crucial variables usually is relatively small. Because of the limitations of time, effort, money, and human intellectual capacity, the normal procedure in explaining any such phenomenon as motivated behavior is to single out key determinants and concentrate the analysis on said factors. Accordingly, "needs," "drives," "tensions," and "expectancy-value" theories have evolved.

It is the opinion of this author and others that the key elements involved in the understanding of motivated behavior are values and value systems. Let us suppose that one asks himself the following question: "Why do I as a human being behave in the manner I do?" Admittedly, answers to such a question would vary. However, the author and undoubtedly many others would *not* answer "because I 'need' to," or "I am 'driven' to do so," or "because of internal 'tensions.'" A more common answer would be "because I 'want' to." Admittedly, most people perform a lot of behavior which they do not particularly "want" to so perform; and, also, not everyone has the opportunity to do everything he "wants" to. However, in general, in our society a person can and does do anything that he "wants" to. Admittedly also, persons "have" to perform some behavior; but laws and rules are relatively few in comparison to the number of alternatives within the laws.

Values represent "wants" or preferences. Values describe what individuals consider to be important. Values represent wants, preferences, likes and/or dislikes for particular things, conditions, or situations. A person's values describe the things or ideas that matter the most to him, things which he will strive and sacrifice for in order to obtain. Values consist of opinions about what is right, fair, just, or desirable. Because values take the form of opinions, they are not subject to scientific or objective testing and validation. In addition, values represent broad guides to action. Debate exists as to whether values as guides characterize, explain, determine and/or control individual behavior.

Value systems are a set of individual values which exist in a scale or a hierarchy that reveals their degree of relative importance. Individuals may all possess the same values but they may attach different priorities or degrees of importance to these values. Value systems are merely priority patterns of values or a ranking of values along a continuum of importance.

Motivated behavior can be explained in terms of values and value systems. This is not to say that "needs," "drives," "tensions," "expectancy-value," and "systems" approaches to the same topic are useless. The author is merely arguing that such approaches are either too broad or too narrow in scope. More insightful analysis is available via the use of the values and value systems concepts.

F. THE IMPORTANCE OF VALUES

The importance of value theory as a possible explanation of motivated behavior has too long been ignored. The importance of values is evident at the individual, group, and organizational levels. Underlying all interpersonal relations are the values which guide men's actions. Thus, in trying to explain why men behave as they do individually or in groups and organizations, we are inevitably led to managerial values. Values and value systems analyses of organizations are especially meaningful in the common situations where the operations are largely a reflection of the personalities of the chief executives. In addition, a new body of current research is evolving that illustrates the relationship of values and value systems to such phenomena as personal goals, interpersonal conflict, group and cultural differences, human adaptability to change, organizational climate, organizational effectiveness, *et cetera*. The vital importance of the concept of values is evidenced in the following quotation:

"It is difficult to conceive of a human problem that would not be better illuminated if relevant and reliable value data concerning it were available. Differences, for example, in culture, social class, occupation, sex, religion, or politics are all equally translatable into questions concerning differences in underlying values and value systems . . ." (18, p. 1).

If it is assumed that values are important determinants of individual behavior, questions that immediately come to mind are, *Why* and *how* do values actually affect behavior? Psychologists tell us that man lives in a universe of events and objects that do not have intrinsic meaning (10, 19). Instead, man records past perceptions that contain information about past events he has experienced. These past perceptions form categories of information which take the form of values about events. The categories, in turn, guide or filter future perceptions and interpretations of encountered objects and events. In short, man's values determine his view of the world.

Values and value systems are important for at least three reasons. First, the information an individual gains as a result of an encounter with one object should apply to other objects in that category. This means that an individual can make an inference about his relationship to an object without directly encountering that object. The inference stems from encountering another object that the individual conceives to be in the same class or category. Second, such categories provide individuals with expectations about those objects that they believe to be members of the same categories. Thus, values can direct perception and behavior by causing an individual to notice certain characteristics of an object and to react to the object on the basis of those characteristics. Third, after a person develops a system of values, this individual now opens up channels of choice along which he is able to move. Without such a system of categories (values) in which to store information, an individual cannot effectively develop a differentiated repertoire of responses;

he cannot desire or "want" things for he has no idea of what he is missing nor does he possess any sense of missing at all. Thus, a system of values constitutes a ready-made format for future thinking and behavioral responses (15). A system of values, accordingly, serves as a frame of reference.

G. How To Measure Motivation and Values

The dilemma of trying to define motivation has previously been mentioned. An even greater problem is to attempt to measure it. Nevertheless, some attempts have been made—basically in the form of tests. Thus, although no one knows exactly what motivation is, nevertheless, there have been numerous attempts to measure it. Basically, two main types of problems are involved; namely, operationally finding a quantitative measure of motivation as a predictor of individual behavior, and developing and designing a technique that will reliably and validly reveal and measure this predictor.

Of late, testing is a hazardous and conspicuous profession—this is especially true of those attempting to measure motivation. In general, tests are all right to find out which applicants *can* do the job, but they do not tell us which ones *will* use the abilities they have; specific tests of aptitude and intelligence are not intended as measures of motivation. Aptitude is important, but it is certainly of little value to hire qualified people if they will not use their qualifications.

If aptitude and intelligence do not measure motivation, what does? Answers are numerous and debatable. Some of the more popular attempts to measure motivation used "personality" and "interest" tests (7). However, the array of devices used in efforts to assess the "will do" component in prediction sometimes seems bewildering. Some devices are simply inventories, others call for choices, and still others make notable attempts to disguise their purpose entirely. Some are based on specific motivational and personality theories, whereas others are developed on a purely empirical basis. Some seek to measure the intensity of designated motives (for example, needs or interests), while others are described as measures of those aspects of the total personality called "temperament trials." In addition, some projective tests are intended to assess one's total personality globally, often on an entirely qualitative basis.

Personality and interest tests are the most common attempts to measure motivation. But there is a variety of both personality and interest tests. The variety stems from efforts to build new tests to overcome deficiencies in existing ones and also from the fact that the relationship between predictor variables and criteria is seldom simple. In general, such measures have not been very successful in predicting subsequent job behavior (motivation). Accordingly, some experts believe that such tests can best be improved by being eliminated.

The fact that predictive validities are quite low for aptitude, interest, temperament, personality, and projective tests means that much work needs to be done to improve motivational assessment. Of the general types of tests that have been mentioned, the interest tests are usually considered to be the most predictive. Intense interests are seen as motivating because by and large people do things that their interests suggest. In recalling the previous discussion of values and value systems, one should notice that interests are included in the value concept. Values have been explained as being priorities, preferences, likes and dislikes—or interests. Not surprisingly, value theory is designed to explore and to improve the analysis of the "will do" component of motivated behavior.

The next obvious question is: "How then do we measure values?" The purpose of this report is not to review the specific techniques and devices developed to attempt to measure values. Accordingly, it can instead merely be stated that, in general, few if any consistently reliable and valid value measuring devices have been developed. In the past, one of the most popular value measuring techniques was the Allport-Vernon-Lindzey Study of Values device. Currently new but popular is some form of the Rokeach Value Survey. Rokeach has developed his Value Survey over the past several years to the point where many experts consider it to be the best value and value systems device presently available. Theoretical and statistical support backing the popularity of this technique is also available. Much and probably most of the current research being done in the area of value theory has utilized this newly developed Rokeach tool. The Rokeach Value Survey consists of two sets of values, each containing 18 individual values. One set is called "terminal" values and represents certain end-states of existence; the other set is labeled "instrumental" values and represents "means" toward achieving the ends or terminal values. Respondents are asked to rank-order the two sets of values, putting a number one in front of the most important value, a number two in front of the second most important value, *et cetera,* until a number 18 is placed in front of the least (or eighteenth most) important value. Additional description and explanation of the Rokeach Value Survey are beyond the scope of this report, but such information is readily available elsewhere (5, 8, 9, 17, 18).

H. SUMMARY

Values and value systems are a new and promising approach to explain motivated behavior. The value theory approach to explain motivation is equally or more insightful than most currently popular theories which are either conceptually too broad or too narrow. Value analysis can be used to understand not only individual behavior, but group and organizational behavior as well. Increased recognition of the contributions of value theory will be forthcoming due to increased value research which has been enhanced by the development of such new value measuring devices as the Rokeach Value Survey.

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AUTHOR INDEX

Allee, M. 87
Altman, Reuben 185
Baer, Daniel J. 161
Bart, William M. 141
Borgen, Jerome S. 217
Breskin, Stephen 265
Burchill, Philip, G. 265
Burns, Jerry 151
Chalmers, Douglas K. 65
Cleland, Charles C. 185
Compton, J. M. 165
du Mas, Frank M. 115
du Mas, Michael E. 115
Dwyer, Francis 181, 261
Estes, Betsy Worth 119
Felker, Donald W. 223
Fenz, Walter D. 11
Gescheider, George A. 253
Hannes, Martin 241
Harlow, Steven D. 217
Horne, E. P. 87
Jones, Ruel E. 31
Kahn, Michael H. 81
Kay, Richard S. 223
Lane, Ellen 49
Lawson, E. D. 229
Levinson, Jerry R. 11
Looft, William R. 207
Meltzer, H. 125
Miller, Patrick A. 213
Mosele, Victor F. 161
Murray, John B. 193
Orpen, Christopher 27, 73
Pedersen, Dahrl, M. 31
Polak, John W. 253
Rudestam, Kjell E. 81
Rush, David 119
Schludermann, Eduard 39
Schludermann, Shirin 39
Scott, J. P. 165
Sheikh, Anees A. 213
Sikula, Andrew F. 277
Streng, John 3
Sutton, Dwight 151
Swartz, Jon D. 185
Van den Daele, Leland D. 269
Walker, Robert V. 65
Weisskopf-Joelson, Edith 95
Williams, John D. 217
Wright, John H. 253

TABLE OF CONTENTS

The generality of learning differences among inbred mouse strains 3
BY JOHN STRENG

The effects of motivation on cardiac activity 11
BY JERRY R. LEVINSON AND WALTER D. FENZ

The relationship between extraversion and tough-mindedness in a "tough-minded" culture 27
BY CHRISTOPHER ORPEN

Human performance in a three-axis tracking problem using two distinct hand controller configurations 31
BY RUEL E. JONES AND DARHL M. PEDERSEN

Adolescents' perception of themselves and adults in Hutterite communal society 39
BY SHIRIN SCHLUDERMANN AND EDUARD SCHLUDERMANN

Biasing factors affecting estimates of fertility rates of schizophrenics . . . 49
BY ELLEN LANE

The use of technical and nontechnical language in communication . . . 65
BY ROBERT V. WALKER AND DOUGLAS K. CHALMERS

The effect of cultural factors on the relationship between prejudice and personality 73
BY CHRISTOPHER ORPEN

The relationship between liking and perceived self-disclosure in small groups 81
BY MICHAEL H. KAHN AND KJELL E. RUDESTAM

Estimation as a function of density and contrast 87
BY E. P. HORNE AND M. ALLEE

Some comments on the psychology of the psychologist 95
BY EDITH WEISSKOPF-JOELSON

The projected brain illusion 115
BY FRANK M. DU MAS AND MICHAEL E. DU MAS

Social schemas: A developmental study 119
BY BETSY WORTH ESTES AND DAVID RUSH

Industrial psychology in *Psychological Abstracts*, 1927-1969 125
BY H. MELTZER

The effect of interest on *horizontal décalage* at the stage of formal operations 141
BY WILLIAM M. BART

Alcohol dose effects on feedback-maintained simple reaction time . . . 151
BY DWIGHT SUTTON AND JERRY BURNS

Political and religious beliefs of Catholics and attitudes toward involvement in the Vietnam war 161
BY DANIEL J. BAER AND VICTOR F. MOSELE

Allelomimetic behavior system: Distress vocalization and social facilitation of feeding in Telomian dogs 165
BY J. M. COMPTON AND J. P. SCOTT

Effect of questions on visualized instruction
By Francis M. Dwyer 181

Dominance-submission in profoundly retarded male subjects under conditions of strong motivation
By Charles C. Cleland, Reuben Altman, and Jon D. Swartz 185

Psychology of the pain experience
By John B. Murray 193

Perceptions across the life span of important informational sources for children and adolescents
By William R. Looft 207

Investigation of some variables influencing stereotypy in interpersonal perception
By Anees A. Sheikh and Patrick A. Miller 213

Creativity, dogmatism, and arithmetic achievement
By John D. Williams, Steven D. Harlow, and Jerome S. Borgen 217

Self-concept, sports interests, sports participation, and body type of seventh- and eighth-grade boys
By Donald W. Felker and Richard S. Kay 223

Semantic differential analysis of men's first names
By E. D. Lawson 229

The effect of right and wrong guesses on two-choice reaction time
By Martin Hannes 241

Detection of vibrotactile signals differing in probability of occurrence
By George A. Gescheider, John H. Wright, and John W. Polak 253

Questions as advanced organizers in visualized instruction
By Francis M. Dwyer 261

Nonverbal rigidity and severity of criminal offense in a group of juvenile delinquents
By Stephen Breskin and Philip G. Burchill 265

Infant reactivity to redundant proprioceptive and auditory stimulation: A twin study
By Leland D. Van den Daele 269

Values and value systems: Importance and relationship to managerial and organizational behavior
By Andrew F. Sikula 277

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Genetic Psychology Monographs *(continued)*

VOLUME 1—1926

1. Performance tests for children of pre-school age—R. Stutsman
2. An experimental study of the eidetic type—H. Klüver
3 & 4. A study of natio-racial mental differences—N. D. M. Hirsch
5. A psychological study of juvenile delinquency by group methods—J. W. Bridges and K. M. B. Bridges
6. The influence of puberty praecox upon mental growth—A. Gesell

VOLUME 2—1927

1 & 2. The mind of a gorilla—R. M. Yerkes
3. The role of eye-muscles and mouth-muscles in the expression of the emotions—K. Dunlap
4. Family similarities in mental-test abilities—R. R. Willoughby
5. Coordination in the locomotion of infants—L. H. Burnside
6. The mind of a gorilla: Part II. Mental development—R. M. Yerkes

VOLUME 3—January-June, 1928

1. An experimental study of the olfactory sensitivity of the white rat—J. R. Liggett
2. A photographic study of eye movements in reading formulae—M. A. Tinker
3. An experimental study of the East Kentucky mountaineers—N. D. M. Hirsch
4. Responses of foetal guinea pigs prematurely delivered—G. T. Avery
5. Objective differentiation between three groups in education (teachers, research workers, and administrators)—M. B. Jensen
6. The effect of segregation on the sex behavior of the white rat as measured by the obstruction method—M. Jenkin

VOLUME 4—July-December, 1928

1. Observation and training of fundamental habits in young children—E. A. Bott, W. E. Blatz, N. Chant, an H. Bott
2 & 3. Determination of a content of the course in literature of a suitable difficulty for junior and senior high schoo students—M. C. Burch
4 & 5. Methods for diagnosis and treatment of cases of reading disability—M. Monroe
6. The relative effectiveness of lecture and individual reading as methods of college teaching—E. B. Greene

VOLUME 5—January-June, 1929

1. The age factor in animal learning: I. Rats in the problem box and the maze—C. P. Stone
2. The effect of delayed incentive on the hunger drive in the white rat—E. L. Hamilton
3. Which hand is the eye of the blind?—J. M. Smith
4. The effect of attitude on free word association-time—A. G. Ekdahl
5. The localization of tactual space: A study of average and constant errors under different types of localization—L. E. Cole
6. The effects of gonadectomy, vasotomy, and injections of placental and orchic extracts on the sex behavior of th white rat—H. W. Nissen

VOLUME 6—July-December, 1929

1. Learning and growth in identical infant twins: An experimental study by the method of co-twin control—A. Gesell and H. Thompson
2. The age factor in animal learning: II. Rats on a multiple light discrimination box and a difficult maze—C. P. Ston
3. The acquisition and interference of motor habits in young children—E. McGinnis
4. A vocational and socio-educational survey of graduates and non-graduates of small high schools of New England—A. D. Mueller
5 & 6. A study of the smiling and laughing of infants in the first year of life—R. W. Washburn

VOLUME 7—January-June, 1930

1. Tensions and emotional factors in reaction—E. Duffy
2. Teacher influence on class achievement: A study of the relationship of estimated teaching ability to pupil achievement in reading and arithmetic—H. R. Taylor
3 & 4. A study of the effect of inverted retinal stimulation upon spatially coordinated behavior—P. H. Ewert
5. A study of the mental development of children with lesion in the central nervous system—E. E. Lord
6. An experimental study upon three hundred school children over a six-year period—N. D. M. Hirsch

VOLUME 8—July-December, 1930

1. The amount and nature of activities of newborn infants under constant external stimulating conditions during th first ten days of life—O. C. Irwin
2. Race and social differences in performance tests—S. D. Porteus, *et al.*
3. Language and growth: The relative efficacy of early and deferred vocabulary training, studied by the method o co-twin control—L. C. Strayer
4. Eye-movements and optic nystagmus in early infancy—J. M. McGinnis
5 & 6. Reactions of kindergarten, first-, and second-grade children to constructive play materials—L. Farwell

VOLUME 9—January-June, 1931

1 & 2. The status of the first-born with special reference to intelligence—H. H. Hsiao
3 & 4. An experimental study of bright, average, and dull children at the four-year mental level—H. P. Davidson
5. An historical, critical, and experimental study of the Seashore-Kwalwasser test battery—P. R. Farnsworth
6. A comparison of difficulty and improvement in the learning of bright and dull children in reproducing a descriptiv selection—F. T. Wilson

VOLUME 10—July-December, 1931

1. A comparative study of a group of southern white and negro infants—M. B. McGraw
2 & 3. An experimental study of prehension in infants by means of systematic cinema records—H. M. Halverson
4. The limits of learning ability in kittens—A. M. Shuey
5 & 6. The effect of habit interference upon performance in maze learning—O. W. Alm

VOLUME 11—January-June, 1932

1. General factors in transfer of training in the white rat—T. A. Jackson
2. The effect of color on visual apprehension and perception—M. A. Tinker
3. The reliability and validity of maze experiments with white rats—R. Leeper
4. A critical study of two lists of best books for children—F. K. Shuttleworth
5 & 6. Measuring human energy cost in industry: A general guide to the literature—R. M. Page

VOLUME 12—July-December, 1932

1. Family resemblances in verbal and numerical abilities—H. D. Carter
2. The development of fine prehension in infancy—B. M. Castner
3 & 4. The growth of adaptive behavior in infants: An experimental study at seven age levels—H. M. Richardson
5 & 6. Differential reactions to taste and temperature stimuli in newborn infants—K. Jensen

VOLUME 13—January-June, 1933

1. A critique of sublimation in males: A study of forty superior single men—W. S. Taylor
2. A study of the nature, measurement, and determination of hand preference—H. L. Koch, *et al.*
3. The growth and decline of intelligence: A study of a homogeneous group between the ages of ten and sixty—H. E. Jones and H. S. Conrad
4. The relation between the complexity of the habit to be acquired and the form of the learning curve in youn children—M. L. Mattson
5. Eating habits in relation to personality development of two- and three-year-old children: A study of sixty-nin

Genetic Psychology Monographs *(continued)*

VOLUME 14—July-December, 1933

1. Mental growth during the first three years: A developmental study of sixty-one children by repeated tests—N. BAY
2. A study of triplets: including theories of their possible genetic relationships—F. N. ANDERSON AND N. V. SCHEIDEMA
3. The objective measurement of emotional reactions—H. V. GASKILL
4. Development of behavior in the fetal cat—J. D. CORONIOS
5. A study of certain language developments of children in grades four to twelve, inclusive—L. L. LABRANT
6. The effect of early and delayed practice on memory and motor performances studied by the method of co-t control—J. R. HILGARD

VOLUME 15—January-June, 1934

1. Studies in the psychology of tone and music—P. R. FARNSWORTH
2. Motor learning of children in equilibrium in relation to nutrition—E. L. BEEBE
3. Discrimination limens of pattern and size in the goldfish *Carassius auratus*—J. B. ROWLEY
4. Limits of learning ability in the white rat and the guinea pig—B. F. RIESS

5 & 6. The limits of learning ability in rhesus monkeys—H. A. FJELD

VOLUME 16—July-December, 1934

1. A statistical study of ratings on the California Behavior Inventory for Nursery-School Children—H. S. CONRAD
2. An eye-movement study of objective examination questions—A. FRANDSEN
3. An experimental study of constitutional types—O. KLINEBERG, S. E. ASCH, AND H. BLOCK
4. The development of a battery of objective group tests of manual laterality, with the results of their application 1300 children—W. N. DUROST

5 & 6. An experimental study in the prenatal guinea-pig of the origin and development of reflexes and patterns behavior in relation to the stimulation of specific receptor areas during the period of active fetal life—L. CARMICHA

VOLUME 17—January-December, 1935

1. Organization of behavior in the albino rat—R. L. THORNDIKE
2. Brightness discrimination in the rhesus monkey—M. P. CRAWFORD
3. The limits of learning ability in cebus monkeys—A. M. KOCH
4. Nature-nurture and intelligence—A. M. LEAHY
5. On intelligence of epileptic children—E. B. SULLIVAN AND L. GAHAGAN
6. A study of the play of children of preschool age by an unobserved observer—D. L. COCKRELL

VOLUME 18—January-December, 1936

1. Sex differences in variational tendency—Q. MCNEMAR AND L. M. TERMAN
2. The process of learning to dress among nursery-school children—C. B. KEY, M. R. WHITE, M. P. HONZIK, A. HEINEY, AND D. ERWIN
3. A study of the present social status of a group of adults, who, when they were in elementary schools, were classifi as mentally deficient—W. R. BALLER
4. The influence of specific experience upon mental organizations—A. ANASTASI

5 & 6. Studies in aggressiveness—L. BENDER, S. KEISER, AND P. SCHILDER

VOLUME 19—January-December, 1937

1. Psychological bases of self-mutilation—C. DABROWSKI
   Masculine temperament and secondary sex characteristics: A study of the relationship between psychological a physical measures of masculinity—H. GILKINSON
2. A psychological study of forty unmarried mothers—R. D. NOTTINGHAM
   Behavior problems in the children of psychotic and criminal parents—L. BENDER
3. Domination and integration in the social behavior of young children in an experimental play situation—H. H. ANDERS
4. The sequential patterning of prone progression in the human infant—L. B. AMES

VOLUME 20—January-December, 1938

1. The relationship between characteristics of personality and physique in adolescents—P. S. DE Q. CABOT
2. Behavior problems of elementary school children: A descriptive and comparative study—I. Y. MASTEN
   Graphic representation of a man by four-year-old children in nine prescribed drawing situations—P. F. GRIDLEY
3. Differences between two groups of adult criminals—R. S. TOLMAN
4. A comparative study by means of the Rorschach method of personality development in twenty pairs of identic twins—E. TROUP
   Individual differences in the facial expressive behavior of preschool children: A study by the time-sampling method C. SWAN

VOLUME 21—January-December, 1939

1. An experimental analysis of "level of aspiration"—R. GOULD
2. Some light on the problem of bilingualism as found from a study of the progress in mastery of English among p school children of non-American ancestry in Hawaii—M. E. SMITH
3. Domination and social integration in the behavior of kindergarten children and teachers—H. H. ANDERSON
   The capacity of the rhesus and cebus monkey and the gibbon to acquire differential response to complex vis stimuli—W. E. GALT
4. The social-sex development of children—E. H. CAMPBELL

VOLUME 22—January-December, 1940

1. Measuring human relations: An introduction to the study of the interaction of individuals—E. D. CHAPPLE
2. Aggressive behavior in young children and children's attitudes toward aggression—M. D. FITE
3. Student attitudes toward religion—E. NELSON
   The prediction of the outcome-on-furlough of dementia praecox patients—J. S. JACOB
   Significant characteristics of preschool children as located in the Conrad inventory—K. H. READ
4. Learning by children at noon-meal in a nursery school: Ten "good" eaters and ten "poor" eaters—J. B. MCCAY, E. WARING, AND P. J. KRUSE
   Studies in the interpretation of play: I. Clinical observation of play disruption in young children—E. H. ERIKSON

VOLUME 23—January-June, 1941

1. An analysis of certain variables in a developmental study of language—F. M. YOUNG
   Infant development under conditions of restricted practice and of minimum social stimulation—W. DENNIS
   An analysis of the mental factors of various age groups from nine to sixty—B. BALINSKY
2. Factors influencing performance on group and individual tests of intelligence: I. Rate of work—M. W. BENNETT
   Individual differences in apperceptive reaction: A study of the response of preschool children to pictures—E. W. AM

VOLUME 24—July-December, 1941

1. Twins *T* and *C* from infancy to adolescence: A biogenetic study of individual differences by the method of co-tw control—A. GESELL AND H. THOMPSON
   Finger nail-biting: Its incipiency, incidence, and amelioration—A. L. BILLIG
   An experimental study of the factors of maturation and practice in the behavioral development of the embryo of t frog, *Rana pipiens*—A. FROMME
2. The Fels child behavior scales—T. W. RICHARDS AND M. P. SIMONS
   Measurement of the size of general English vocabulary through the elementary grades and high school—M. K. SMI
   Stereotypes in the field of musical eminence—P. R. FARNSWORTH

VOLUME 25—January-June, 1942

1. A study of factors determining family size in a selected professional group—J. C. FLANAGAN
   A genetic study of geometrical-optical illusions—A. WALTERS
   Interpretation of behavior-ratings in terms of favorable and unfavorable deviations: A study of scores from the Re Conrad Behavior Inventory—K. H. READ AND H. S. CONRAD
2. Are there any innate behavior tendencies?—J. B. SCHOOLLAND
   An investigation of the intelligibility of the speech of the deaf—C. V. HUDGINS AND F. C. NUMBERS

Genetic Psychology Monographs *(continued)*

VOLUME 26—July-December, 1942

1. The critical frequency limen for visual flicker in children between the ages of 6 and 18—V. L. MILLER
   Some factors determining handedness in the white rat—K. L. WENTWORTH
2. Motivation and behavior—E. FRENKEL-BRUNSWIK

VOLUME 27—January-June, 1943

1. Comparison of children's personality traits, attitudes, and intelligence with parental occupation—N. R. MADDY
2. A comparative study of mental functioning patterns of problem and non-problem children seven, eight, and nin years of age—M. L. PIGNATELLI

VOLUME 28—July-December, 1943

1. Separation anxiety in young children: A study of hospital cases—H. EDELSTON
2. Correlates of vocational preferences—W. A. BRADLEY, JR.

VOLUME 29—January-June, 1944

1. Mental changes after bilateral prefrontal lobotomy—S. D. PORTEUS AND R. D. KEPNER
2. A twin-controlled experiment on the learning of auxiliary languages—B. PRICE, W. J. KOSTIR, AND W. M. TAYLOR

VOLUME 30—July-December, 1944

1. A method of administering and evaluating the thematic appreciation test in group situations—R. M. CLARK
2. A study of anxiety reactions in young children by means of a projective technique—R. TEMPLE AND E. W. AMEN

VOLUME 31—January-June, 1945

1. The evolution of intelligent behavior in rhesus monkeys—B. WEINSTEIN
2. Perceptual behavior of brain-injured, mentally defective children: An experimental study by means of the Rorschach technique—H. WERNER

VOLUME 32—July-December, 1945

1. A clinical study of sentiments: I.—H. A. MURRAY AND C. D. MORGAN
2. A clinical study of sentiments: II.—H. A. MURRAY AND C. D. MORGAN

VOLUME 33—January-June, 1946

1. Interpretation of spontaneous drawings and paintings—T. S. WAEHNER
   Preferences for sex symbols and their personality correlates—K. FRANCK
2. Outstanding traits: In a selected college group, with some reference to career interests and war records—F. L. WELL AND W. L. WOODS

VOLUME 34—July-December, 1946

1. The relation of emotional adjustment to intellectual function—J. L. DESPERT AND H. O. PIERCE
   The smiling response: A contribution to the ontogenesis of social relations—R. A. SPITZ
2. Finger-painting and personality diagnosis—P. J. NAPOLI

VOLUME 35—January-June, 1947

1. The thematic apperception technique in the study of culture-personality relations—W. E. HENRY
2. A continuation study of anxiety reactions in young children by means of a projective technique—M. DORKEY AN E. W. AMEN
   A study of the vocational interest trends of secondary school and college women—A. M. CAWLEY

VOLUME 36—July-December, 1947

1. Maze test validation and psychosurgery—S. D. PORTEUS AND H. N. PETERS
2. The diagnostic implications of Rorschach's test in case studies of mental defectives—I. JOLLES

VOLUME 37—January-June, 1948

1. The radio day time serial: A symbolic analysis—W. L. WARNER AND W. E. HENRY
   The relation of personality characteristics and response to verbal approval in a learning task—G. L. GRACE
2. The mechanism of vision: XVIII. Effects of destroying the visual "associative areas" of the monkey—K. S. LASHLE
   A study of the relationship between handwriting and personality variables—P. CASTELNUOVA-TEDESCO

VOLUME 38—July-December, 1948

1. Modern language learning: The intensive course as sponsored by the United States Army, and implications for th undergraduate course of study—M. LIND
   Conflict: A study of some interactions between appetite and aversion in the white rat—M. A. TOLCOTT
2. Schizophrenia and the *MAPS* test: A study of certain formal psycho-social aspects of fantasy production in schiz phrenia as revealed by performance on the Make a Picture Story (*MAPS*) Test—E. S. SHNEIDMAN
   A study of the transmission of authority patterns in the family—H. L. INGERSOLL

VOLUME 39—January-June, 1949

1. A study of the psychoanalytic theory of psychosexual development—G. S. BLUM
   The assessment of parental attitudes in relation to child adjustment—E. J. SHOBEN, JR.
2. Qualitative differences in the vocabulary responses of normals and abnormals—H. FEIFEL
   The relative effectiveness of motion and still pictures as stimuli for eliciting fantasy stories about adolescent-pare relationships—P. E. EISERER
   The organization of hereditary maze-brightness and maze-dullness—L. V. SEARLE

VOLUME 40—July-December, 1949

1. An experimental study of what young school children expect from their teachers—B. BIBER AND C. LEWIS
   A study of the relative effects of age and of test difficulty upon factor patterns—H. A. CURTIS
   A projective experiment using incomplete stories with multiple choice endings—J. K. SEATON
2. Effects of sex role and social status on the early adolescent personality—E. MILNER
   Social perceptions and attitudes of children—M. RADKE, H. TRAGER, AND H. DAVIS

VOLUME 41—January-June, 1950

1. Some psychological and educational aspects of pediatric practice: A study of well-baby clinics—L. H. BLUM
   One-trial learning in the domestic rat—B. B. HUDSON
   An introduction to the principles of scientific psychoanalysis—A. ELLIS
2. Awareness of racial differences by preschool children in Hawaii—D. V. SPRINGER
   Age trends in children's evaluation of teacher-approved and teacher-disapproved behavior—S. L. WITRYOL
   The relationship between level of vocational aspiration and certain personal data: A study of some traits and i fluences bearing on the prestige level of vocational choice—J. STUBBINS

VOLUME 42—July-December, 1950

1. Personality patterns of suicidal mental hospital patients—N. L. FARBEROW
   Sex-rôle identification in young children in two diverse social groups—M. RABBAN
2. A study of the influence of the social field on individual behavior: As revealed in the expression of hostility a warmth by neurotics and paranoid schizophrenics in discussion group situations—D. SHAPIRO
   An experimental study of avoidance—R. F. HEFFERLINE

VOLUME 43—January-June, 1951

1. A study of copying ability in children—E. A. TOWNSEND
   Prestige motivation of gifted children—D. P. AUSUBEL
2. A psychological study of physical scientists—A. ROE

VOLUME 44—July-December, 1951

1. The organization of hostility controls in various personality structures—S. FISHER AND E. HINDS
   Children and radio: A study of listeners and non-listeners to various types of radio programs in terms of selecte ability, attitude, and behavior measures—E. A. RICCIUTI
2. Quantitative expression in young children—W. E. MARTIN
   The use of magnetic devices in the collection and analysis of the preverbal utterances of an infant—A. W. LYNIP

VOLUME 45—January-June, 1952

1. Japanese-American personality and acculturation—W. CAUDILL
2. A statistical study of the Freudian theory of levels of psychosexual development—C. A. BARNES
   Personality characteristics of selected disability groups—D. N. WIENER

Genetic Psychology Monographs *(continued)*

VOLUME 46—July-December, 1952

1. The relationship of social status, intelligence, and sex of ten- and eleven-year-old children to an awareness o poverty—F. J. Estvan
   An empirical study of the castration and Oedipus complexes—S. M. Friedman
2. The relationship between projective test scoring categories and activity preferences—M. M. Schwartz
   A comparison of formal and content factors in the diagnostic testing of schizophrenia—M. Sherman

VOLUME 47—January-June, 1953

1. Ability and accomplishment of persons earlier judged mentally deficient—D. C. Charles
   Variations in the consistency of the behavioral meaning of personality test scores—M. Kornreich
2. Some child-rearing antecedents of aggression and dependency in young children—R. R. Sears, *et al.*
   Symptom correlates for descriptive diagnosis—J. R. Wittenborn, *et al.*

VOLUME 48—July-December, 1953

1. Age and mental abilities: A longitudinal study—W. A. Owens, Jr.
   The development of a personality questionnaire for drinkers—P. J. Hampton
   Personality and physical disease: A test of the Dunbar hypothesis applied to diabetes mellitus and rheumatic fever—D. H. Crowell
2. Socio-economic contrasts in children's peer culture prestige values—B. Pope
   A critical review of the stability of social acceptability scores obtained with the partial-rank-order and the paired comparison scales—S. A. Witryol and G. G. Thompson
   A study of the effects of color on Rorschach responses—G. G. Brody

VOLUME 49—January-June, 1954

1. Factors underlying major reading disabilities at the college level—J. A. Holmes
   Parent behavior toward first and second children—J. K. Lasko
2. Social-status and intelligence: An experimental study of certain cultural determinants of measured intelligence—E. A. Haggard
   Certain determinants and correlates of authoritarianism—S. Siegel
   Personalities in faces: I. An experiment in social perceiving—P. F. Secord, W. F. Dukes, and W. Bevan

VOLUME 50—July-December, 1954

1. A study of the relationship between play patterns and anxiety in young children—E. W. Amen and N. Renison
   Operational exploration of the conceptual self system and of the interaction between frames of reference—M. Edelson and A. E. Jones
   Problem solving: A statistical description of some relationships between organismic factors and selected response measures—N. A. Fattu, E. Kapos, and E. V. Mech
2. The relation of cortical potentials to perceptual functions—C. Chyatte
   The import for clinical psychology of the use of tests derived from theories about infantile sexuality and adult character—D. W. Miles
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VOLUME 51—January-June, 1955

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VOLUME 53—January-June, 1956

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Genetic Psychology Monographs *(continued)*

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ERRATUM

ORPEN, C. Prejudice and adjustment to cultural norms among English-speaking South Africans. *J. of Psychol.*, 1971, **77**, 217-218. P. 217, line 18, the sentence should read: "The scales consisted of (*a*) a 12-item measure of anti-African prejudice (PR), developed by Andrew M. Colman at the University of Cape Town, according to the scale-discrimination technique of Edwards and Kilpatrick . . . from actual statements made by White South Africans about Africans in an informal group session, which is relatively high as regards unidimensionality (rep. = .86) and discriminating power (phi = .65). . . ." Credit to Andrew Colman was inadvertently omitted.

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(Manuscripts are printed in the order of final acceptance)

Attitudinal reaction of white females toward two black female collaborators . 3
By Wayne A. Burroughs and Cabot L. Jaffee

Randomization tests with statistical control over concomitant variables . . 13
By Eugene S. Edgington

Developmental factors in masturbation: Family background antecedents and later personality patterns 21
By Donald B. Mazer and Alvin R. Mahrer

Adolescent perception of parent behavior (CRPBI) in Hutterite communal society 29
By Shirin Schludermann and Eduard Schludermann

Paternal attitudes in Hutterite communal society 41
By Shirin Schludermann and Eduard Schludermann

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Recognition paired-associate learning in preschool children 49
By S. Joyce Brotsky and T. June Carlin

Performed actions as determinant of horizontal decalage in a logical structure: I. The quantitative aspect 55
By Arne Vikan

Relationship between kinesthetic and spiral aftereffect and Eysenck's theory of personality 63
By V. K. Kool

Effects of noncompetitive, competitive instructions, and sex on performance in a color-word interference task 67
By Peter O. Peretti

The effects of body size and body markings on nonpolarized schooling behavior of zebra fish (*Brachydanio rerio*) 71
By Lee I. McCann, David J. Koehn, and Ned J. Kline

Some correlates of negative reaction tendencies in institutionalized retarded children 77
By David Balla, Elizabeth McCarthy, and Edward Zigler

A study of student values 85
By Norman Greenfeld

Reaction time as a function of magnitude estimations of vibrotactile internal noise 91
By George A. Gescheider and John H. Wright

Temperament characteristics of chronic alcoholics as measured by the Guilford-Zimmerman Temperament Survey 97
By Gerald J. Mozdzierz, Frank J. Macchitelli, Lawrence Flaherty, and Robert deVito

Zen and the psychology of education 103
By Alonzo M. Valentine, Jr.

Effect of intermittency on stereopsis 111
By Diane L. Smolen, Robert W. Grossman, and S. Howard Bartley

The bipolarity of semantic space as related to concept complexity 119
By John T. Atwood and Steven D. Falkenberg

The relationship of cue strength and temporal interval to schizophrenic associative disorders 123
By C. William Deckner, Howard C. Greenberg, and Thomas F. Cash

Group risk taking and expected values 131
By John J. Hartnett

Comparative analysis of concurrent and predictive validity for the GATB Clerical Aptitude Test Battery 135
By Russell N. Cassel and Gerold W. Reier

Behavioral correlates of the EEG in delinquents 141
By James A. Beshai

Published as a separate and in *The Journal of Psychology,* 1971, 79, 3-11.

ATTITUDINAL REACTION OF WHITE FEMALES TOWARD TWO BLACK FEMALE COLLABORATORS*

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WAYNE A. BURROUGHS AND CABOT L. JAFFEE

A. INTRODUCTION

In recent years several authors have encouraged the study of behavioral measures of attitudes (e.g., 2, 3, 9). This approach differs from the traditional one which has emphasized the use of questionnaires which suffer the disadvantages of reactive or obtrusive measures (8).

Few laboratory studies have been accomplished to date in which measures of behavior toward Negroes have been used as the dependent variable. Burnstein and McRae (1) found that more prejudiced subjects (measured by a verbal scale) sent Negro group members fewer communications than they sent white group members in a group problem-solving session even though the Negroes had the same amount of information concerning the solution to the problem. Whitacre and Jaffee (10) used a leaderless group discussion paradigm and presented 20 "concept formation" problems to groups of three subjects—two white naive females and either a black or white confederate who was always the high talker in the group. At the end of the discussion period following each problem, subjects voted for the person other than themselves whom they thought "had the most insight" into the problem. The authors found that the Negro confederates received significantly less votes than did their white counterpart. In this case it appeared that voting behavior of white girls toward two high-talking black collaborators evidenced prejudicial action when compared to the same behavior toward a high-talking white collaborator.

On the assumption that the situation by Whitacre and Jaffee noted above does provide a relatively unobtrusive way of measuring prejudicial behavior or voting biases toward Negroes, it seemed worthwhile to extend their findings by varying certain conditions, such as the confederates themselves, the quality of their performance, and the type of reward conditions under which voting occurred.

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B. METHOD

1. *Subjects*

Subjects for the experiment were 192 white female undergraduate students enrolled in introductory psychology at the University of Tennessee. Two female Negro collaborators also served in the experiment—each serving in 48 groups. Subjects participated in groups of three, one of whom was always one of the Negro collaborators. Therefore, each of the 96 groups was composed of two white females and one Negro female.

2. *Experimental Setting and Apparatus*

The experiment was conducted in an 8′ by 12′ room separated from an observation room by a one-way mirror of which the subjects were aware. In the room was a large table around two sides of which the three subjects were seated. On the table facing each subject was a control box which allowed private voting for other group members by means of a rotary switch. A microphone permitted the subjects' discussion to be monitored in the adjoining room. A concept board containing lights in six rows of six lights each (numbered 1-36) was positioned on one wall plainly visible to all subjects. Each light had an associated geometric figure which differed according to size, shape, color, and position in space. Three numbered lights above this concept board were used to signal different phases of the experiment.

In the adjoining room, the experimenter controlled both the concept lights and signal lights by means of toggle switches. Other apparatus in the control room included a control panel which allowed the experimenter to read the voting choices of group members, three microswitches connected to three timer clocks to record duration of speech of the participants, and a stopwatch to time different phases of the experiment.

3. *Experimental Design*

The experimental design was a 2 × 2 × 3 fixed effects factorial design with eight groups or 16 observations per cell (4). The independent variables were (*a*) first black collaborator *versus* second black collaborator, (*b*) high *versus* low quality of the black collaborators' performances, and (*c*) conditions of nonreward, reward, or power.

The conditions of high and low quality of performance by the black collaborators were accomplished by requiring them to follow a script. The same 16 problems were presented to all groups. Two series of answers and reasons for them were developed by the experimenter and memorized by both collaborators. In the high quality condition, the collaborator presented approximately 50 concepts in her 16 answers; whereas, in the low quality condition she used approximately 25 concepts. Furthermore, she was reinforced or received the "correct" answer six times in the high quality condition and only two times in the low quality condition. White subjects received the "correct" answer two times each in the high quality condition and six times each in the low quality condition. The reinforcement schedules were random except that the total number of "correct" answers for each subject was equally divided between the first eight and second eight problems. Thus in the high quality condition there were six problems to which no one got the "correct" answer; whereas, in the low quality condition there were two such problems. Actually, there were no correct answers to any of the problems.

The three conditions of nonreward, reward, or power were introduced by means of instructions prior to the last eight problems and were designed to simulate reward contingencies that exist in everyday interracial contacts. The experimental session consisted of 16 problems. For all groups the first eight problems were presented under nonreward conditions. Then depending on the experimental condition, the experimenter (*a*) simply presented problems 9 through 16 (nonreward), (*b*) announced that 20 cents would be paid for each correct vote or correct answer (reward), or (*c*) announced that each subject would receive 10 cents for every vote received from other group members (power). In the reward condition, the subjects were offered money contingent upon the accuracy of their own voting behavior (accuracy was defined as voting for the person who got the "correct" answer). Thus, attention to the relevant cues available—e.g., quality of arguments and performance on preceding trials—was rewarded. On the other hand, the power condition produced a situation in which each subject received money each time another subject voted for her. Since no subject was allowed to vote for herself this meant that each subject's vote was worth 10 cents per trial to one of the other participants. Thus, subjects were not punished (did not fail to receive money) for ignoring the relevant performance cues available even though the instructions indicated that they should not ignore these cues. In other words, each subject had the "power" to give another subject 10 cents per trial. In either the reward or power conditions the maximum amount which could be earned by each subject was $1.60.

4. *Procedure*

Subjects were met by the white experimenter and escorted to the room in which the study was conducted. Two naive subjects and an experimental confederate were seated in the 8′ by 12′ room in front of the concept board. Instructions were read which explained the task and procedure involved. Subjects were to discuss each problem following the announcement of their individual choices. After 90 seconds they were asked to vote for the person "other than yourself whom you think had the most insight into the problem and is most likely to have the correct answer." Finally the correct answer was shown and the next problem was presented.

The experimenter then entered the control room. One of two lights was flashed in the collaborator's control box to indicate to her whether she was to follow the high quality or low quality script. Both collaborators followed the script with no difficulty. Then the first eight problems were presented. Duration of speech for each subject and votes of the two white subjects were recorded on each problem. In all conditions the collaborator was instructed to talk between 50 and 70 percent of the time in each half of the experiment. Again signal lights in the collaborator's control box were used to aid in this task. Following problem 8, one of the three reward conditions—nonreward, reward, or power—was introduced by further instructions to the subjects.

Then problems 9-16 were presented. Again, voting behavior of the white subjects was recorded for each problem and duration of speech was recorded for each of the three subjects for trials 9-16.

Following the sixteenth problem all subjects completed a three-item questionnaire in which they ranked all three group members with respect to speech duration, best ideas, and number of correct answers. Subjects were then paid (except in nonreward condition) and dismissed.

C. Results

Chi square analyses of the questionnaire data showed that the collaborators were perceived to have had more "best ideas" and "correct answers" under the high quality condition as opposed to the low quality condition ($\chi^2 = 50.50$, $p < .001$ and $\chi^2 = 134.93$, $p < .001$, respectively). Furthermore, there was a significant chi-square value for the data on the first question regarding duration of speech ($\chi^2 = 18.71$, $p < .01$). Thus the ranking of the collaborators with respect to duration of speech was dependent on the condition of high or low quality of performance.

Two of the independent variables—collaborator and quality of performance—were operative throughout the entire experiment, or trials 1-16. Analysis of variance with the number of votes received by the black collaborator from each naive subject in trials 1-16 as the dependent variable indicated that collaborators performing under high quality conditions received more votes than under low quality conditions ($F = 45.29$, $p < .01$). Furthermore, there was a significant interaction ($F = 7.05$, $p < .01$) between quality of performance and the reward conditions introduced by instructions. Figure 1 illustrates this finding.

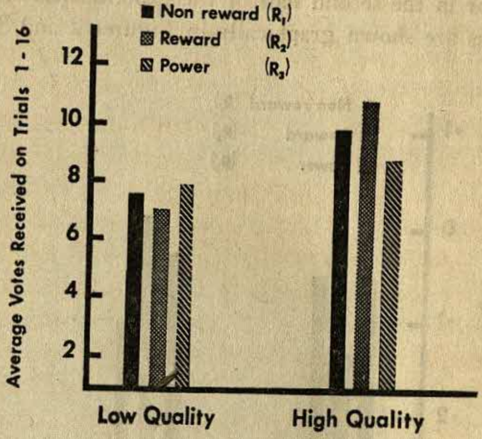

FIGURE 1
GRAPHIC REPRESENTATION OF THE INTERACTION BETWEEN LOW AND HIGH QUALITY OF PERFORMANCE AND THE REWARD CONDITIONS R_1, R_2, AND R_3 WITH VOTES ON TRIALS 1-16 AS THE DEPENDENT VARIABLE

Since the significant F test for interaction did not yield specific information concerning where the interaction occurred, independent groups t tests were performed comparing the three pairs of means. These comparisons showed that the low quality nonreward *versus* the high quality nonreward conditions were significantly different ($t = 4.29$, $p < .01$) and that the low quality reward *versus* the high quality reward conditions were significantly different ($t = 5.70$, $p < .01$).

Finally, in order to evaluate the effects of the three reward conditions introduced by instructions prior to trial nine, on voting behavior of the naive subjects toward the two collaborators, analysis of variance was performed with each subject's change in voting score from the first eight trials to the second eight trials as the dependent variable. The change score for each subject represented the difference between the number of times she voted for the collaborator during the first and second half of the experiment. This analysis indicated a significant collaborator effect ($F = 4.40$, $p < .05$), and significant interaction effects between collaborator and reward, and also between quality of performance and reward ($F = 5.57$, $p < .01$; $F = 5.47$, $p < .01$ respectively).

The greater change scores associated with the first collaborator were negative, thus indicating that the naive subjects reduced the number of their votes for the first collaborator more so than they reduced their votes for the second collaborator in the second half of the experimental session.

The interactions are shown graphically in Figures 2 and 3 respectively.

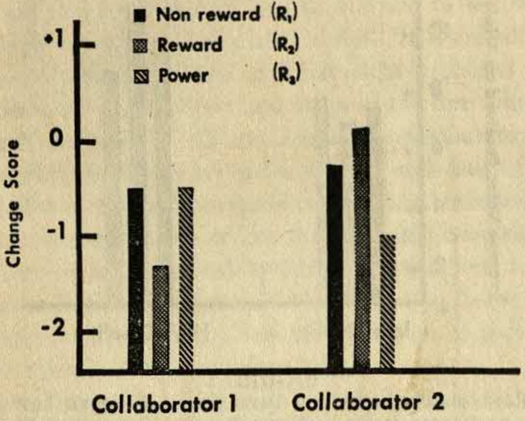

FIGURE 2
GRAPHIC REPRESENTATION OF THE INTERACTION BETWEEN COLLABORATORS 1 AND 2 AND THE REWARD CONDITIONS R_1, R_2, AND R_3 WITH CHANGE SCORE AS THE DEPENDENT VARIABLE

Again, in order to clarify the interaction results, independent groups t tests were performed between the appropriate pairs of means shown in Figures 2 and 3. Two significant differences were found. In Figure 2 the mean change score for collaborator 1 reward is lower than the mean change score for collaborator 2 reward ($t = 3.43$, $p < .01$). In Figure 3 the mean change score for low quality power condition is significantly higher than the mean change score for the high quality power condition ($t = 3.32$, $p < .01$).

D. DISCUSSION

Quality of performance of the collaborator was a significant variable in leading to black reception of votes from white participants. Thus the relevant cue of quality was not overridden by the collaborator's blackness and other characteristics. One would expect no significant difference between mean votes received in the low and high quality conditions if white subjects were responding merely to skin color. In terms of Festinger's (5) theory of cognitive dissonance, any dissonance which occurred within white subjects because the collaborator's performance in the high quality condition was surprising, was not generally reduced by the withholding of votes from the black collaborator.

Comparing the low and high quality conditions (see Figure 1), the offering of a reward for correct votes (R_2) or no reward at all (R_1) led to a greater increase in votes than did the power condition (R_3). This difference obtained even though the reward variable was active in the second half of each session only. Therefore, this same interaction is seen again even more dramatically when the dependent variable is change score as opposed to total votes on all 16 trials (see Figure 3).

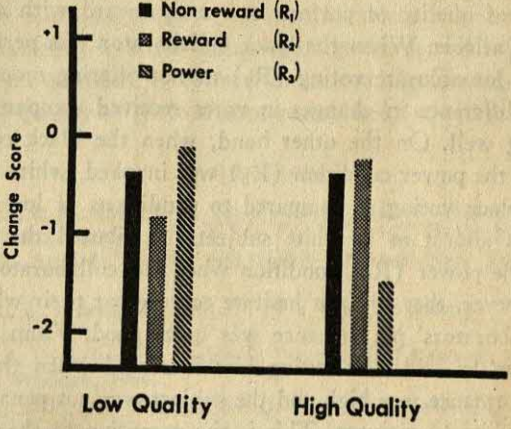

FIGURE 3
GRAPHIC REPRESENTATION OF THE INTERACTION BETWEEN LOW AND HIGH QUALITY OF PERFORMANCE AND THE REWARD CONDITIONS R_1, R_2, AND R_3 WITH CHANGE SCORE AS THE DEPENDENT VARIABLE FOR BOTH COLLABORATORS

The significant difference in change score indicating that collaborator one received less votes in the second half of the experiment is evidence that the naive white subjects' reaction to her was more negative than toward collaborator two. This finding is not incongruent with results reported by Katz and Cohen (6). In a study of two-man biracial teams, they found that a confident show of ability by Negroes led to their reception of lower ratings on a questionnaire completed by their white partners. It should be noted that on the basis of descriptions written by the experimenter prior to the analysis of data, collaborator one was judged to be considerably more dark skinned, assertive, or outgoing in her group interaction and showed more definite traces of the traditional Negro dialect than did collaborator two. Furthermore, there was a highly significant interaction between the collaborator and reward variables (see Figure 2). Thus the offering of reward (R_2) to white subjects in groups with collaborator one led to a much larger decrease in votes received when compared to collaborator two ($p < .01$). On the other hand the power condition (R_3) led to a nonsignificant difference between reduction in votes received by collaborator one *versus* collaborator two. The white subjects seemed to be reacting to individual characteristics, since "racial" reactions would imply more consistent voting behavior toward the two collaborators.

Even though there were significant differences in white voting behavior toward the two black collaborators, perhaps the most meaningful result is the interaction of quality of performance and reward with change score as the dependent variable. When the black collaborator was performing poorly, offering money for accurate voting (R_2) or not offering money (R_1) led to no significant difference in changes in votes received compared to when she was performing well. On the other hand, when the black collaborator was doing well and the power condition (R_3) was invoked, white subjects greatly reduced their black voting as compared to conditions of low quality of performance. It is almost as if white subjects distributed the money (votes) evenly under the power (R_3) condition when the collaborators' performance was poor. However, they did not hesitate to vote for their white counterpart when the collaborators' performance was quite good. From still a different viewpoint it can be said that voting bias increased when the collaborator's quality of performance was high and the subject was not penalized for voting for the other white participant. This is the exception to the prior statement that *S*s did not generally reduce any dissonance created by high quality black performance by withholding votes. In the power condition white *S*s did avoid voting for the black collaborator even though her performance was quite good. The notion that when expectancies are contradicted by evidence a negative reaction occurs is supported by these data, as well as by Rosenthal and Jacobson (7). Moreover, it should be noted that 11 of the 12 change scores shown in Figures 2 and 3 are negative. Thus in general the collaborators received fewer votes in the second half of the experiment than they received in the first half.

Admittedly, generalization of such experimental results is dubious and depends to a great extent on the unobtrusiveness of the measures used. However, the data do seem to imply that programs which offer tangible rewards for nonbiased behavior toward blacks may be perferable to situations in which either no reward exists or no penalty is incurred for biased behavior. However, this seems true only when the quality of black performance is high.

E. SUMMARY

*S*s included 192 white female introductory psychology students and two black female collaborators, who participated in groups of three in an experiment involving 16 concept problems. The dependent variable was number of votes cast by white subjects for the black group member as having the most insight and as being most likely to have the correct answer to each problem. Independent variables were (*a*) two black collaborators, (*b*) high and low quality of performance by the black collaborators, and (*c*) three conditions of reward in the second half of the experimental session. It was found that (*a*) both black collaborators received more votes under high quality of performance *versus* low quality ($p < .01$), (*b*) white subjects voted less for the more dark skinned, assertive collaborator in the second half of the session ($p < .05$); (*c*) conditions of reward interacted significantly with both the collaborator and quality of performance variables ($p < .01$).

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RANDOMIZATION TESTS WITH STATISTICAL CONTROL OVER CONCOMITANT VARIABLES*

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A. INTRODUCTION

Randomization tests are distribution-free or nonparametric tests that derive a sampling distribution of a test statistic from permutations or combinations of the measurements. Consider a randomization test for a difference between treatments A and B, with random assignment of five subjects to A and five to B, using the difference between means as the test statistic. For a one-tailed test where A is expected to yield the stronger responses, one would determine the statistic $\overline{X}_A - \overline{X}_B$ for every one of the 252 partitions of the 10 scores into five for A and five for B and determine what proportion of the 252 statistics were as large as the obtained difference between means. The proportion would be the probability of getting such a large $\overline{X}_A - \overline{X}_B$ value as the obtained value, if the null hypothesis were true. Various books (1, 3, 6, 8) discuss the properties of randomization tests and give examples.

Inasmuch as randomization tests, unlike other nonparametric tests, use the actual measurements rather than ranks, they are powerful substitutes for parametric tests. For example, the test described in the previous paragraph has been shown to be as powerful as the *t* test when the assumptions for the *t* test have been met, and, of course it can also be legitimately applied when those assumptions are not met (7, p. 422). Bradley (1, p. 83) stated that "randomization tests appear to be superior or equal to their parametric counterparts in the generality of cases, superiority giving way to equality in those cases where the parametric assumptions are met."

The principal objection to randomization tests has been their impracticality due to the enormous amount of computation involved (1, p. 84). For instance, suppose one were to use a randomization test for correlation between 20 pairs of measurements. A correlation coefficient would be computed for every way of pairing the 20 measurements in one set with those in the other, and then to determine the significance of the correlation one would see what proportion

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of those correlation coefficients were as large as the obtained coefficient. There are more than 2×10^{18} different pairings and, therefore, that many correlation coefficients to compute for the sampling distribution. Even with the use of electronic computers the computational time would be excessive.

Approximate randomization tests, however, can be used to bring the amount of computation down to a practical level (4). An approximate randomization test is a randomization test in which the significance of an obtained statistic is determined by using an approximate sampling distribution consisting of a random sample of the statistics in the entire sampling distribution. A computer could be programmed to select randomly 999 of the 2×10^{18} pairings of the scores for the above correlational problem and compute a correlation coefficient for each of those 999 pairings. These 999 correlation coefficients *plus* the obtained coefficient constitute an approximate sampling distribution of 1000 coefficients. The significance of the obtained correlation coefficient would then be determined by the proportion of the 1000 coefficients that was as large as the obtained value. This approximate randomization test based on a random sample of 999 pairings is almost as powerful as the regular randomization test. For example, the probability is .99 that a correlation coefficient (or any other test statistic) which would be shown by a randomization test to be significant at the .01 level would be significant at the .018 level if an approximate randomization test based on 1000 statistics were used. Thus, an electronic computer could determine the significance of the correlation coefficient within a few minutes by using an approximate randomization test which has almost as much power as the regular randomization test.

As electronic computers become assessible to researchers, therefore, the argument against randomization tests based on the amount of computation involved can be met by using approximate randomization tests. For some investigators at the present time and for many more in the future the randomization test may be a competitor with parametric tests in practical application. Consequently, there is merit in considering how to apply randomization tests for special types of statistical analysis where the manner of application is not immediately obvious. The remainder of this paper will treat the special problem of applying randomization tests as substitutes for analysis of covariance or partial correlation in statistically controlling for the effect of concomitant variables.

B. Analysis of Covariance

Analysis of covariance is performed in order to control statistically for the effect of variables that one does not want to affect his results. It consists of an analysis of variance performed with transformed dependent variable measures that express the magnitude of the dependent variable relative to the value that would be predicted from a regression of the dependent variable on the variable whose effect is to be eliminated. For example, consider a comparison of the effects of two drugs on body weight. If the difference between the weights of the subjects in the two treatment groups were tested, one might fail to get significant results simply because the large variability in pre-experimental body weight made the statistical test relatively insensitive to the difference in the drug effects. One might control for the effect of pre-experimental body weight by carrying out analysis of variance with difference scores: that is, with the gain in weight. Generally, however, statistics books recommend the use of analysis of covariance instead of difference scores whenever the assumptions of analysis of covariance are met. Analysis of covariance has the advantage over difference scores of taking into consideration the degree of correlation between the control or concomitant variable (such as pre-experimental body weight) and the dependent variable (such as final body weight), thereby providing a more powerful test.

Analysis of covariance also can control for the effects of an extraneous variable in situations where there are no relevant difference scores, as in the case where the concomitant variable is different in kind from the dependent variable. For example, one may want to compare various methods of learning while controlling for differences in intelligence. Subjects will differ within and between groups with regard to intelligence, and inasmuch as variation in intelligence leads to variation in learning performance that is not a function of the experimental treatments, it is desirable to remove this effect. Analysis of covariance can be used in such a case to increase the power of the test by controlling for differences in intelligence. The effect of analysis of covariance is to express the dependent variable in relative terms, in this instance as learning performance of a person relative to the performance expected of a person of that level of intelligence. The "expected" performance is that shown by the regression of performance on intelligence.

How would one perform analysis of covariance in the form of a randomization test? First, before conducting the experiment one takes a measure of the concomitant variable, such as intelligence. By taking the measure at this time one ensures that the concomitant variable is not affected by the treatment. Then subjects are randomly assigned to the alternative treatments: for example, five subjects to treatment A and five to treatment B. (In this and other examples in the paper, small samples will be assumed in order to simplify the discussion. For sample sizes usually involved in psychological experiments, approximate randomization tests would be used instead of ordinary randomization tests.) Suppose the experimenter's concern is with the differential effects of the treatments on the number of words memorized in a given period of time. He could use as a concomitant variable the score on an intelligence test given before the subjects are assigned to treatment groups. Then an analysis of covariance test, utilizing both the intelligence test scores and the memory scores, would be conducted to obtain a value of F. Up to this point, the research design and analysis would be conducted in the same fashion as if a parametric test were being employed. However, when F has been computed in the regular use of analysis of covariance the significance of F is determined by reference to published probability tables which are based on various parametric assumptions like normality, homogeneity of variance, and linearity of regression of the dependent variable on the concomitant variable. If one did not want the validity of the test to depend on those assumptions, the randomization test would be used. For the randomization test, the significance of F would be determined in this fashion. For every one of the 252 ways of dividing the 10 scores into five for treatment A and five for B, a value of F is computed by the use of analysis of covariance on that set of data, just as was done for the obtained data. Since each of the 252 divisions is equally probable under the null hypothesis, computation of F by the use of analysis of covariance on each division as though it represented the obtained data provides a sampling distribution of 252 equally probable F values, provided the null hypothesis is true. The significance of the value of F for the obtained data is then determined by noting the proportion of the 252 values of F that are as large as the obtained value.

Now it was stated above that the randomization test for analysis of covariance would be used if one did not want the validity of the test to depend on the assumptions underlying analysis of covariance. But if in fact the assumptions for analysis of covariance are doubtful, why use a randomization test of analysis of covariance? Obviously, if one uses analysis of covariance, even in the form of a randomization test, it is because he thinks he can thereby improve the power of his analysis of variance test, and the power would only be increased if the assumptions were approximately met. For example, with a decidedly curvilinear relationship between the concomitant and the dependent variable, ordinary linear analysis of covariance might be rather insensitive to differences between groups. If the assumptions of analysis of covariance are considerably in error, analysis of covariance is not likely to increase the power of an analysis of variance test. This is true both of the standard parametric application of analysis of covariance and of the randomization test just described.

With regard to the power of a test, then, considerable departure from the assumptions underlying analysis of covariance has the same effect on both the parametric application and the randomization test. But there is another respect in which the effect is different. When the assumptions are *not* met, not only is the parametric test not powerful, but it is also invalid. On the other hand, the randomization test may have less power when the parametric assumptions of analysis of covariance are not met, but it is still a valid test. Thus, the randomization test for analysis of covariance should be used when one thinks the parametric assumptions are approximately met, but wants the test to be valid even if the assumptions are incorrect. Parametric assumptions can be incorporated into a randomization test in a manner that increases the *power* of the test if the assumptions are correct but does not affect the *validity* if the assumptions are wrong.

C. PART CORRELATION

An adjustment analogous to that of analysis of covariance is sometimes made in computing a correlation coefficient. Partial correlation is frequently used for the purpose of controlling for the effect of an extraneous variable on the correlation between two other variables. For instance, one may want to correlate height with weight in children with age "held constant" in the sense that the correlation will be the result of something other than the fact that older children tend to be both taller and heavier. There is a special kind of partial correlation, called part correlation, that is useful in experimental situations for controlling for the effect of an extraneous variable on the dependent variable (2, pp. 206-210). Suppose an experiment was conducted with random assignment of five subjects to room temperatures of 60, 65, 70, 75, and 80 degrees, to determine the effect of room temperature on intellectual performance. The correlation between the independent variable, temperature, and the dependent variable, intellectual performance, could be computed to test the null hypothesis of no effect of temperature. However, the subjects would vary in intellectual performance not only as a result of variation in the room temperature (provided the temperature had an effect), but also because of differences in intelligence. Now, if higher temperatures tended to provide only slightly better intellectual performance, this effect could be masked if the less intelligent subjects happened to be assigned to the rooms with the higher temperatures. One could use part correlation to eliminate the effect of intelligence on the intellectual performance by expressing the intellectual performance scores as performance scores relative to amount of intelligence. That is, instead of using the raw performance scores in the correlation, one would use the performance relative to the performance expected for a person of that intelligence. The manner in which a part correlation coefficient is computed will now be considered.

For the application of part correlation to experimental data, measurements of the concomitant variable in this example, intelligence, should be made prior to assignment of subjects to treatments. As in the case of analysis of covariance, the measurement is carried out at this time in order to ensure that these measurements are not affected by the independent variables. Then subjects are randomly assigned to the various magnitudes of the independent variable, temperature; and measurements of the dependent variable, intellectual performance, are made. Next, a regression line based on the correlation between intelligence test scores and intellectual performance is computed for predicting intellectual performance from intelligence test scores. Then each of the intellectual performance scores is expressed as a "residual"; that is, as a deviation score relative to the regression line. For instance, if the performance score of a person fell on the regression line, his residual or deviation score would be zero, whereas if it were two points below the regression line, it would be —2. The final step is to correlate the independent variable with the deviation or residual scores and to determine the significance of the correlation.

In the case of a randomization test the significance of the correlation is, of course, not determined from published tables. There are 120 ways of pairing the two sets of five temperatures and five performance measures. For each of these a part correlation between temperature and performance is computed, and the distribution of 120 part correlation coefficients constitutes the sampling distribution used for determining the significance of the obtained value. The significance is the proportion of the 120 coefficients that are as large as the obtained value.

As in the case of the randomization test of analysis of covariance, this randomization test is most powerful when the parametric assumptions are met, but nonetheless is a valid test even when the assumptions are not met.

D. SUMMARY

The use of an approximate randomization test that utilizes a random sample of the statistics in the entire sampling distribution for a randomization test reduces the computation to a practical level with little loss of power

when electronic computers are accessible. Inasmuch as randomization tests are as powerful as their parametric counterparts when parametric assumptions are met and, being distribution-free, are valid when parametric assumptions are not met, the possibility of their practical utilization in the form of approximate randomization tests makes it worthwhile to examine some applications of randomization tests not previously studied. In this paper randomization tests were described for controlling for concomitant variables in analysis of covariance and part correlation. When the parametric assumptions are met, the randomization tests are most powerful; but when they are not met, the tests are still valid, although less powerful. Thus, an investigator could employ these randomization tests to increase the power of his test in the event that the parametric assumptions are met, but without having his results invalidated if the parametric assumptions are wrong.

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DEVELOPMENTAL FACTORS IN MASTURBATION: FAMILY BACKGROUND ANTECEDENTS AND LATER PERSONALITY PATTERNS*

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A. INTRODUCTION

Research on developmental factors in masturbation is limited to reports of the early family background as contributing sexual misinformation (9) and threats and punishments for the masturbatory act (3). Research and case studies presume a single masturbatory type or personality pattern characterized by anxiety, depression, and guilt; self-punishment, impotence, and narcissistic body involvement (1, 2, 4, 5, 6, 10, 11). The purpose of the present study was to identify family background antecedents related to masturbation, and to investigate whether masturbators fall into personality patterns with distinctively related family background antecedents.

B. METHOD

1. *Subjects*

*S*s were 260 Miami University male students; the mean age was 20, with a range from 17-31 years of age. Students in classes throughout the departments of the university were invited to serve as participating investigators by contributing information about their family background and personal problems to a data pool for a long range research project on the relationships between family background and personal problems. The procedure for the overall project was described, including methods of assuring confidentiality, sample questions, and an invitation to discuss the findings of each study with the research team.

2. *Instrumentation*

Data were obtained by means of the Psychological History Inventory (PHI) and the Psychological Problem Inventory (PPI). The PHI (8) is

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a checklist of 355 questions about specific family background events judged as significant in the development of personal problems. The PPI (7) is a checklist of 300 personal problems taken verbatim from the presenting complaints of patients at phychiatric hospitals, outpatient clinics, and private practitioners.

3. *Procedure*

Each *S* was given an individual appointment at the Psychological Clinic. With advanced-psychology graduate students as proctors, *S* was escorted to a private room, given a sealed folder containing the description of the research project, instructions, answer sheets, PHI, and PPI. Age and sex of the *S* were requested; emphasis was placed on the need for accuracy in describing family background and personal problems. Instructions for the PHI and PPI were, respectively, to circle each item true about the person's family background, and to circle each item which identified a current personal problem, trouble, worry, or bother. With no time limit, most *S*s completed the inventories within 35-45 minutes. The packet was then reinserted into the folder, sealed, and returned to the proctor.

Male *S*s endorsing the two PPI items pertaining to problem masturbation were included in the experimental group: "I wish I wouldn't masturbate." "I try to go a while without masturbating, but I always end up masturbating secretly." Excluding *S*s who endorsed only one of the two criterion items, the experimental group of problem masturbators included 115 *S*s, and the control group contained 145 *S*s. Each group was randomly divided into two subgroups for modified cross-validation.

Chi-square analyses compared the frequencies of positive endorsements, in experimental and control groups, for each item of the PHI and PPI (excluding the two criterion items). Items having cell frequencies of 5 or less were tested by Fisher's Direct Probability Test. Items discriminating (.05 level) the total groups and at least one of the split-half cross-validation comparisons were treated as significant discriminators.

Product moment corrolations were calculated between all cross-validated discriminating items, once within the experimental group and again within the control group. Separate analyses extracted six, five, four, three, and two factors by Thurstone's Centroid method. By means of Kaiser's Varimax procedure, factors were rotated to an approximation of simple structure. The amount of variance contributed by each factor to the total variance was calculated for both experimental and control groups. A four factor rotation was selected on the basis of amount of variance accounted for and factor interpretability.

C. Results

Of the 355 PHI and 300 PPI items, 48 significantly ($<.05$) differentiated between total experimental and control groups. On modified cross-validation, 33 of these items held as significant differentiators, 25 discriminating at the .01 level, eight between .01 and .05 levels. Of these 33 items, 25 were from the PPI; only eight items of the 355-item PHI differentiated the problem masturbators from the controls. For all 33 items, the frequencies of positive endorsements were higher in the problem masturbator group.

It is noteworthy that of the eight PHI items that discriminated the problem masturbators from the controls, only three clearly pertain to early family antecedents, the balance referring to more recent history: When you were younger than 12, were you the sort of child who never skipped a day from elementary school to take off and get away, either by yourself or with other kids? When you were younger than 12, did your father make the family laugh with his funny stories? Are you named after your father (the same first name or junior)? If you were or are married, is (or was) your wife working regularly, has she her own bank account and is she making more money than you? Did you ever have an operation to have some growth removed (like a boil, a tumor, a goiter)? Did they take away or not renew your teaching certificate, driver's license, union card? Did you go to church regularly for years and then give it up completely? Do you do little things like your father did (e.g., bite your nails, scratch your head, crack your knuckles)?

Because of zero variance, four of the 33 differentiating items were excluded from factor analyses. Items comprising the factors loaded at or beyond the .01 probability level; interpretation was based on items of higher loadings. Table 1 contains the four factors characterizing the problem masturbators; for reasons of space, Table 1 includes only items with factor loadings above .37: (I) Frustrated Immature Nonmasculinity (9.9%), including modeling after other males, ineffectual anger outbursts, self-criticism, anxiety, concerns about lack of masculinity, and emotional lability; (II) Sexual Impulse Anxiety (9.3%), a bipolar factor characterized by a continuum representing feelings about sexual impulse expression, with components of sexual daydreams and fantasies, castration fears, anxiety, and disturbed self-consciousness; (III) Phallic-Centeredness (6.9%), characterized by focalized phallic involvement, especially about penis size, erection, exhibition, and narcissism; some depressed affect was also present; (IV) Guilt-Authority (6.3%), characterized by a sense of guilt in relationships with external authority, including sexual guilty moral-religious guilt-authority, and criticism from vocational superiors.

TABLE 1
FACTORS OF DIFFERENTIATING PPI AND PHI ITEMS CHARACTERIZING PROBLEM MASTURBATORS

Factor	Item	Loading
I.	1. I try to imitate and copy the way some guy talks.	+.65
	2. I bite the skin on the inside of my mouth.	+.59
	3. I feel terrible that a friend saw me break down and cry.	+.57
	4. When I get really angry, I slam doors almost as hard as I can.	+.45
	5. My voice at times seems too high, not like a man's voice.	+.43
	6. Do you do little things like your father did (e.g., bite your nails, scratch your head, crack your knuckles)?	+.41
	7. I like to stand in front of the mirror posing, making muscles.	+.38
II.	1. I have daydreams of sexy girls.	+.58
	2. When I am about to say something in a group, my heart pounds hard.	—.53
	3. Did you ever have an operation to have some growth removed (like a boil, a tumor, a goiter)?	—.43
	4. When I talk to a girl, I look at her lips and think about kissing her.	+.38
III.	1. I look at myself in the mirror and think that my penis is too small.	+.52
	2. There must be something wrong with me cause I can't ever really blow up.	+.47
	3. I stood near the window; they could see my penis.	+.45
	4. I like to stand in front of the mirror posing, making muscles.	+.45
	5. Sometimes during the day, my penis gets erect and hard.	+.44
	6. I never tried suicide but I'm depressed. Can't think of anything but killing myself, dying.	+.43
IV.	1. I secretly buy magazines with pictures of girls in them.	—.66
	2. Did you go to church regularly and then give it up completely?	—.53
	3. My boss tells me I am too slow.	—.42

The 33 significantly differentiating items were also factor analyzed in the control group to assess the extent to which the items formed similar factors. The four factors were (I) Uninterpreted (11.1%); (II) Paranoid Sexual Withdrawal (9.3%), including paranoid tendencies, sexual withdrawal, and some depression; (III) Phallic-Centeredness (6.9%), characterized by phallic involvement, especially about penis size, erection, arousal, and masturbation;

(IV) Masculine Identification Problems (6.6%), characterized by modeling after other males, sex-role concerns, homosexual worries, problems with authority, and some suicidal depression. Factor III, Phallic-Centeredness, was present in both problem masturbator and control groups, but with significantly greater frequency-magnitude in the problem masturbator group.

D. Discussion

With regard to developmental factors in masturbation, it is compelling that of 355 history items, only eight were related significantly to the problem masturbator group, and of these, five pertained to more recent history events. Such results provide meager evidence of family background antecedents as developmental factors in later masturbation. When consideration is given to the potential role of artifacts in the methodology and instrumentation, the results suggest the need for an alternative hypothesis to that of direct linkages between childhood family background antecedents and later masturbation problems in college males.

An identificational bond with the father is suggested in two PHI items: Are you named after your father (the same first name or junior)? Do you do little things like your father did (e.g., bite your nails, scratch your head, crack your knuckles)? Indications of early conformity to school and church are given in two other PHI items: When you were younger than 12, were you the sort of child who never skipped a day from elementary school to take off and get away, either by yourself or with other kids? Did you go to church regularly for years and then give it up completely? An alternative hypothesis generated from the results is that only a meager thread of family background antecedents, suggestive of an identificational bond with the father and early conformity to school and church, constitute direct developmental linkages with later problem masturbating.

Instead of direct linkages between childhood background antecedents and adult masturbation problems, the results are open to at least three lines of interpretation: (*a*) Problem masturbation in adults bears little or no unique, differential direct linkages to childhood background antecedents. (*b*) If present, the direct linkages are not of the kind investigated in the present study. (*c*) Childhood background antecedents mediate their influence through an intervening set of personality patterns. According to this mediating linkage hypothesis, childhood antecedents are linked to childhood personality patterns which later may be manifested as adult problem masturbation. Linkages can be established between childhood background antecedents and personality patterns, and between personality patterns and adult masturbation, but research designed to investigate direct linkages between adult problem masturbation and childhood antecedents would be blocked by diffusing mediating personality patternings (8).

In place of a single "masturbatory type," the findings may be interpreted as supporting at least four masturbatory personality types or patterns, incorporating the characteristics found in prior research and case studies: viz., anxiety, depression, and guilt; self-punishment, impotence, and narcissistic body involvement. We are inclined to interpret masturbation as the behavior expression of at least four different personality patterns, each composed of needs or goals and accompanying negative feelings.

Stated as working hypotheses, the four characteristic personality patterns are as follows: I. Problem masturbation is directed toward achieving an acceptable state of childlike, effeminate immaturity, free of masculine adult pressures. However, these persons react against their own immaturity and nonmasculinity with feelings of frustration, anxiety, self-criticism, and anger. Masturbating serves as a means of being immature and nonmasculine, but with accompanying distress and discomfort. II. Problem masturbation is a behavioral expression of a bipolar pattern including the experiencing of intense sexual feelings through fantasies and daydreams, and the other pole of dissolving and reducing the tension of exacerbated sexual impulses. However, these persons react against their own sexual impulses with anxiety, fear, and threat. Masturbating serves as a means of either undergoing heightened sexual experiencing or of reducing the pressure of intense sexual impulses, but with accompanying anxiety, fear, and threat. III. Problem masturbation is a behavioral expression of a wholesale involvement in phallic-centeredness. However, these persons react against this tendency with painful concerns and depression. Masturbating serves as a means toward an increasing phallic-centeredness, but with accompanying negative feelings. IV. Problem masturbation is a behavioral means of acting out against and achieving independence from external moral-sexual-vocational authority. However, these persons react against such behavioral tendencies with guilt feelings. Masturbation serves as a means of being independently defiant, but with accompanying distressing feelings of guilt.

Although a four factor rotation was selected, other rotations might disclose different personality patterns. Furthermore, the study was designed to extract only the differences between the two groups; untapped communalities may well be present. Not only was the present study restricted to self-report, but to nonpatient college males and not other populations or clinical groups.

E. SUMMARY

The purpose was to identify family background antecedents and personality patterns characteristic of problem masturbators. On the basis of responses to a 355-item personal history inventory and a 300-item psychological problem inventory, 115 male college students were assigned to a problem masturbator group and 145 to a control group. Cross-validated results indicate that among college males, those who endorse problems of masturbation may be said to be predominantly similar to other college males in family background antecedents and personality patterns, except for a small residual of significantly differentiating characteristics that occur in four personality patterns: I. Frustrated, immature nonmasculinity; II. Sexual impulse anxiety; III. Guilt-authority; and IV. Phallic-centeredness. The latter personality pattern was present in significantly greater magnitude in the problem masturbator group, and the three former personality patterns were unique to the problem masturbator group.

Of 355 history items, only eight held on cross-validation as significantly differentiating the problem masturbator group from controls. Instead of direct linkages between childhood background antecedents and adult masturbation, a mediating linkage hypothesis is proposed.

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ADOLESCENT PERCEPTION OF PARENT BEHAVIOR (CRPBI) IN HUTTERITE COMMUNAL SOCIETY*[1]

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A. INTRODUCTION

In a previous study Schludermann and Schludermann (17) described the Hutterite adolescents' perception of themselves and adults and related the results to the age-sex hierarchy within the Hutterite communal society. The present study attempted to investigate how the communal child-rearing system of the Hutterites influences the adolescent's perception of parent behavior. The Hutterite child-rearing practices were described in detail in earlier studies (11, 16). Salient features of Hutterite child rearing are as follows: (*a*) There are institutions (e.g., kindergarten, German school, Sunday school, baptism classes) designed to indoctrinate systematically Hutterite children and adolescents in Hutterite ideals. (*b*) Many functions which in our society are carried out by parents—e.g., supervising young children, enforcing order during mealtimes, disciplining children and adolescents—are carried out in Hutterite society by specially appointed "teachers." (*c*) Emphasis is on the internalization of values rather than on enforcing conformity via threats of physical punishment.

The investigators attempted to design this study in such a way that its results could be related to the data and theories of other investigators dealing with parent-child relationships. It is thereby hoped that this study will not only add to our understanding of Hutterites, but also will examine the generality of some theoretical formulations concerning parent-child relationships. In developing the *Children's Reports of Parental Behavior Inventory* (CRPBI), Schaefer and his co-workers (1, 12, 14) found that the same questions could appropriately be used to describe both parents' behavior. Factor analyses of these repeated studies revealed three replicable factors: Acceptance *versus* Rejection, Psychological Autonomy *versus* Psychological Control, and Firm Control *versus* Lax Control. Previous studies with Belgian

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children (12) and Canadian adolescents (15) suggest that these factors represent basic dimensions that are generalizable across cultural groups.

The purpose of this study was to test the following hypotheses:

(*a*) Hutterite adolescents would describe their parents along the same three basic dimensions (i.e., Acceptance, Psychological Control, and Firm Control).

(*b*) Hutterite adolescents would perceive the mother as more accepting and exercising greater psychological control than the father. The father would be perceived as exercising more firm control than the mother.

(*c*) Girls would perceive both parents as more accepting than boys would. Boys would tend to perceive both parents as exercising more firm control than girls would.

Hypotheses (*b*) and (*c*) were based on the findings of several previous studies (e.g., 1, 2, 3, 4, 5, 6, 8, 9, 10, 18, 19). These studies indicated that the mother was usually seen as more loving and nurturant than the father. Compared with the father she was seen as exercising more psychological control, especially with girls. On the other hand, the father was perceived as being more strict and as using more physical punishment, especially with boys. He was also described as being more fear-arousing than the mother.

The studies also revealed that boys and girls perceived parental behavior differently. Compared with girls, boys complained more often about being punished. Older children tended to see the same-sexed parent as being less benevolent and as more frustrating than the opposite-sexed parent. Moreover, Hoffman's (7) study suggested that girls were more disturbed by love-withdrawal and boys were more disturbed by threats to autonomy. She also suggested that the unqualified assertion of power by the parent is seen by boys as a threat to autonomy, while girls interpreted this type of parental behavior as rejection. Consequently, when describing parental behavior boys would emphasize autonomy, while girls would emphasize affectional ties.

B. METHOD

1. *Subjects*

One hundred and eighty-two adolescents (71 boys and 111 girls), 13 to 15 years old, participated in the study. They came from 20 Hutterite colonies in rural Manitoba.

2. *The Instrument*

The adolescents' perception of their parents was assessed by a modified version of Schaefer's (13) *Children's Reports of Parent Behavior* Inventory

(CRPBI). Schludermann and Schludermann (15) developed a shortened version of the CRPBI[2] consisting of 18 scales, 108 items (six scales with eight items per scale, 12 scales with five items per scale). The 108 items dealing with maternal behavior are identical to those dealing with paternal behavior. In order to make the instrument suitable for cross-cultural studies, the investigators carefully eliminated any items that were inappropriate for ethnic and religious minority groups in Canada (e.g., items presupposing urban living, access to radio and television, pocket money). In a methodological study Schludermann and Schludermann (15) demonstrated that the factor structure of this modified CRPBI was very similar to that of Schaefer's original version and that the three factors were highly replicable across parent's forms, sex groups, and independent samples. Because of the high replicability of the CRPBI factors the authors suggested that the adolescent perception of parental behavior could be described adequately and economically in terms of factor scores of three basic dimensions: Acceptance, Psychological Control, and Firm Control.

The items of the CRPBI contain statements describing parental behavior. The *S*s are asked to indicate whether the item describes behavior which is "Like" (scored 3) or "Somewhat Like" (scored 2) or "Not Like" (scored 1) their parents' behavior. The scale score is calculated by adding the scores on the items that compose the scale and by dividing this total by the number of items in a given scale (either 5 or 8).

3. *Data Collection*

The CRPBI was administered to small groups of Hutterite adolescents. The *S*s were given the same standard instructions as those used by Schaefer. The *S*s were asked to describe the behavior of both parents in the same session.

C. RESULTS

1. *Factor Structure*

Since previous studies demonstrated (e.g., 15) that the factor structure of the CRPBI is the same for boys and girls, father's and mother's forms, the investigators decided to pool together the data on father's and mother's forms for boys and girls, and to factor analyze these pooled data. The resulting correlation matrix of 18 × 18 scale scores was factor analyzed by the principal axes method with an eigenvalue of 1.0 as the cutoff criterion. The resulting three factors (accounting for 64 percent of the total variance) were rotated orthogonally according to the Varimax criterion. With the use of only those scales that have significant loadings (above ±.40) on a factor, the three factors may be described as follows:

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[2] The modified form and scoring sheet of the CRPBI can be obtained either directly from the authors or from NAPS. A copy of the modified CRPBI has been deposited with NAPS. Order Document No. 01182 from National Auxilliary Publication Service, c/o CCM Information Corp., 909 Third Avenue, New York, N. Y. 10022; remitting $2.00 for microfiche or $5.00 for photocopies.

TABLE 1
VARIMAX FACTORS OF CRPBI

Scale	F_{PC}	F_{A}	F_{FC}
1. Acceptance	.16	.83	—.20
2. Childcenteredness	.17	.85	—.03
3. Possessiveness	.50	.56	.15
4. Rejection	.33	—.18	.79
5. Control	.72	.31	—.15
6. Enforcement	.64	.06	.23
7. Positive Involvement	.24	.85	—.08
8. Intrusiveness	.66	.32	.13
9. Control through Guilt	.70	.30	.10
10. Hostile Control	.75	.19	.29
11. Inconsistent Discipline	.43	—.04	.67
12. Nonenforcement	.11	—.08	.76
13. Acceptance of Individuation	.02	.69	.05
14. Lax Discipline	.07	.48	.62
15. Instilling Persistent Anxiety	.74	—.09	.19
16. Hostile Detachment	.31	—.26	.77
17. Withdrawal of Relations	.53	—.05	.54
18. Extreme Autonomy	—.21	.28	.71

(*a*) F_{PC} *Psychological Control vs Psychological Autonomy Factor*. The scales that described this factor were Hostile Control, Control, Instilling Persistent Anxiety, Control through Guilt, Intrusiveness, Enforcement, Withdrawal of Relations, Possessiveness, and Inconsistent Discipline. The scales describe parental control through psychological pressure techniques. This factor was highly similar to the $F_{PC\text{-}PA}$ factor of a previous study on Canadian adolescents in Winnipeg (15).

(*b*) F_{A}. *Acceptance vs Rejection Factor*. This factor was composed of the following scales: Acceptance, Childcenteredness, Positive Involvement, Acceptance of Individuation, Possessiveness, and Lax Discipline. This factor was also highly similar to the $F_{A\text{-}R}$ factor of the previous study (15).

(*c*) F_{FC}. *Firm Control vs Lax Control Factor*. Seven scales described this factor: Rejection, Hostile Detachment, Nonenforcement, Extreme Autonomy, Inconsistent Discipline, Lax Discipline, and Withdrawal of Re- ations. This factor resembled highly the $F_{FC\text{-}LC}$ factor of the previous tudy (15).

Thus it appears that Hutterite adolescents perceived their parents along the same three dimensions according to which adolescents from other cultural backgrounds describe the behavior of their parents. The data support hypothesis (*a*).

2. *Between Groups and Within Groups Comparisons*

In order to examine hypotheses (*b*) and (*c*) two sets of analyses were made:

1. Group means and standard deviations of the 18 scale scores were calculated separately for boys and girls, for father's and mother's forms. For each parent form, the significance of differences in scale scores between boys and girls was examined by *t* tests of independent means (Table 2). On the other hand, for a given sex group the scale scores of the father's and mother's forms were compared by *t* tests of correlated means (Table 2). The scale score analyses allowed descriptive comparisons of boys *vs* girls, fathers *vs* mothers at a concrete behavioral level.

2. Factor scores of F_{PC}, F_A, and F_{FC} were calculated on the basis of the above-mentioned overall factor analysis (data of boys and girls, on fathers and mothers pooled together). The three factor scores (F_{PC}, F_A, and F_{FC}) whereby a given child described a given parent were used as the input for subsequent analysis. Group means and standard deviations of the three factor scores were calculated separately for boys and girls, for father's and mother's forms. For each factor, the significance of differences in the description of a given parent between boys and girls was tested by *t* tests of independent means (Table 3). On the other hand, for a given sex group the factor scores of the father's and mother's forms were compared by *t* tests of correlated means (Table 3). Because factor scores describe parental behavior in terms of fewer but more comprehensive dimensions the use of factor scores, rather than scale scores, provided a more economical and effective analysis to test hypotheses (*b*) and (*c*).

Table 3 shows that boys perceived both parents as significantly higher ($p < .05$ to .01) on the Firm Control dimension, while girls tended to perceive both parents as significantly higher ($p < .01$ to .001) on the Acceptance dimension. Thus the results of this study supported hypothesis (*c*). Compared with boys, the girls' descriptions of both parents were significantly higher ($p < .05$ to .001) on the following scales: Acceptance, Childcenteredness, Positive Involvement, and Acceptance of Individuation. Compared with girls, the boys' descriptions of both parents were significantly higher ($p < .05$ to .001) on the following scales: Rejection, Inconsistent Discipline, Hostile

TABLE 2
CRPBI SCALES: *t* TESTS FOR INDEPENDENT AND CORRELATED MEANS

	On fathers					On mothers					Boys	Girls
	Boys		Girls		B *vs* G	Boys		Girls		B *vs* G	Fa. *vs* Mo.	Fa. *vs* Mo.
Scales	$\overline{X}$	*SD*	$\overline{X}$	*SD*	*t* test	$\overline{X}$	*SD*	$\overline{X}$	*SD*	*t* test	*t* test	*t* test
1	23.6	4.7	26.0	4.1	—3.56***	24.3	4.0	26.7	3.8	—3.95***	—1.86	—2.62*
2	22.5	4.8	24.6	5.0	—2.75**	23.4	4.1	25.2	4.1	—2.82**	—1.88	—2.06*
3	19.8	4.9	20.9	4.5	—1.59	20.7	4.4	21.6	4.3	—1.34	—1.58	—1.69
4	16.1	4.6	14.0	4.0	3.17**	16.0	4.6	13.9	3.6	3.31**	0.03	0.14
5	21.9	4.6	21.5	4.7	0.57	22.0	4.7	22.8	4.7	—1.02	—0.27	—3.34***
6	20.3	4.7	18.7	4.1	2.41*	19.3	4.4	18.9	3.8	0.53	2.06*	—0.77
7	22.6	4.7	24.5	5.1	—2.61**	23.1	4.5	25.4	4.4	—3.41***	—1.06	—2.55*
8	20.0	5.4	19.3	5.3	0.80	20.4	4.8	20.0	4.8	0.52	—0.92	—1.95
9	20.0	5.1	19.6	5.1	0.51	21.2	4.8	21.0	4.7	0.23	—2.26*	—3.56***
10	20.0	4.7	19.3	4.3	1.09	20.6	4.1	19.9	4.1	1.01	—1.36	—2.12
11	17.0	5.3	14.9	4.5	2.60**	17.6	5.1	15.3	4.3	3.04**	—1.17	—1.03
12	17.2	4.6	16.4	4.2	1.16	17.2	4.3	15.9	4.0	2.07*	—0.07	1.31
13	21.7	3.8	22.2	4.1	—0.91	22.0	3.4	23.2	3.8	—2.30*	—0.64	—3.29**
14	18.4	4.8	18.3	4.6	0.16	18.8	4.4	18.6	4.0	0.27	—0.89	—0.96
15	18.0	5.0	16.5	4.7	—1.97*	18.7	4.3	17.4	4.5	2.06*	—1.53	—2.15*
16	16.0	5.1	14.0	4.3	2.76**	16.5	4.8	13.7	3.9	4.18***	—1.17	1.04
17	17.0	5.1	15.4	4.9	2.08*	17.7	4.7	15.6	4.2	3.11**	—1.25	—0.63
18	17.2	5.9	16.3	5.5	1.05	17.5	6.0	16.5	5.0	1.21	—0.61	—0.60

Note: See Table 1 for list of scales.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

TABLE 3

CRPBI Factor Scores: *t* Tests for Independent and Correlated Means

	On fathers					On Mothers					Boys	Girls
	Boys		Girls		B *vs* G	Boys		Girls		B *vs* G	Fa. *vs* Mo.	Fa. *vs* Mo.
Factors[a]	$\bar{X}$	*SD*	$\bar{X}$	*SD*	*t* test	$\bar{X}$	*SD*	$\bar{X}$	*SD*	*t* test	*t* test	*t* test
F_{PC}	0.10	1.11	—0.19	1.02	1.76	0.18	0.98	0.01	0.90	1.17	—1.10	—3.57***
F_A	—0.40	0.97	0.11	1.08	—3.27**	—0.24	0.85	0.30	0.91	—4.04***	—1.79	—3.27**
F_{FC}	0.22	1.16	—0.13	0.94	2.13*	0.29	1.07	—0.19	0.83	3.20**	—0.90	1.17

* $p < .05$.
** $p < .01$.
*** $p < .001$.

[a] Factors: F_{PC} Psychological Control *versus* Psychological Autonomy; F_A Acceptance versus Rejection; F_{FC} Firm Control *versus* Lax Control.

Detachment, Withdrawal of Relations, and Instilling Persistent Anxiety. In addition, boys perceived their mothers as being higher ($p < .05$) than their fathers on Nonenforcement, and their fathers as being higher ($p < .05$) than their mothers on Enforcement.

The results provided only partial support for hypothesis (*b*). The data from girls were partly consistent with this hypothesis, but the data from boys were not (Table 3): Compared with fathers, mothers were perceived by girls as being higher on the Acceptance and Psychological Control dimensions. Boys did not perceive any significant difference between mothers and fathers along these two dimensions. Neither boys nor girls tended to perceive their fathers as exercising more firm control than did their mothers. At the behavioral level (Table 2) girls described their mothers as being significantly higher ($p < .05$ to $.001$) than their fathers on the following scales: Acceptance, Childcenteredness, Positive Involvement, Acceptance of Individuation, Control, Control through Guilt, Hostile Control, and Instilling Persistent Anxiety. Compared with fathers, mothers were perceived by boys as being significantly higher ($p < .05$) on the Control through Guilt scale and being significantly lower ($p < .05$) on the Enforcement scale.

D. Discussion

The results of this study suggest that Hutterite adolescents perceived parental behavior along the same three basic dimensions (i.e., Acceptance, Psychological Control, and Firm Control) that appeared in studies of American and Belgian children (e.g., 12) and of Canadian adolescents (15). The fact that the many peculiarities of Hutterite child-rearing practices did not affect the factor structure of the CRPBI suggests that these three basic dimensions have a wide generality across cultural groups. The results also suggest that the modified form of the CRPBI can give truly comparative information when it is used to study adolescents from different cultural backgrounds.

As was mentioned previously, Hoffman (7) suggested that girls tend to perceive parents primarily in terms of acceptance and rejection, while boys tend to perceive parental behavior in terms of restriction and autonomy. The results of this study suggested that Hoffman's generalization seems to be valid in the case of Hutterite adolescents: Compared with boys, girls described both parents as being more accepting. Compared with girls, boys described both parents as being more restrictive. The agreement of the Hutterite data with Hoffman's hypothesis was not entirely unexpected: Both Hutterite and traditional American societies share similar sex-role stereotypes: Girls are encouraged to be dependent and to develop affectional relationships. Boys, on the other hand, are encouraged to become relatively independent and to become emotionally more detached than girls.

The hypothesis that the mother is perceived as exercising more acceptance and psychological control, while the father is perceived as exercising more firm control was also examined in this study. The results give only partial support to this generalization and seem to be meaningful in terms of Hutterite child-rearing practices. Neither boys nor girls perceived that the father exercised more firm control. In a Hutterite colony restrictions on adolescent behavior are imposed primarily by the colony rather than by the parents. There are colony officials (such as German teacher, minister, etc.), rather than parents, who make the rules, supervise children, and enforce discipline. Compared with the father in American society, the Hutterite father is much less of an agent for enforcing rules through punishment.

Compared with the father, the mother was perceived by girls as being more accepting and exercising more psychological control. Boys, on the other hand, did not perceive any such difference between mothers and fathers. Since these results are somewhat unexpected no definitive explanation can be given. Nevertheless, the investigators would make some tentative suggestions in terms of Hutterite society that might make these results meaningful: Hutterite adolescent boys spend most of the day out of the home—e.g., in school, with peer mates, under the supervision of adults not necessarily parents. Adolescent girls, on the other hand, spend a large amount of time at home helping their mothers. The most frequent parent-adolescent contact is therefore between mothers and adolescent girls. As was mentioned earlier, the Hutterite ideals of love and brotherhood would direct interpersonal relationships along the acceptance-rejection dimension. It was also pointed out that in Hutterite society, the predominant mode of socialization is psychological control via internalized norms. Since adolescent girls have more intimate contact with their mothers than their fathers, they can observe their mother's behavior more closely; thus the acceptance of and psychological control by the mother would be perceived more clearly by girls than by boys.

E. SUMMARY

One hundred and eighty-two Hutterite adolescent boys and girls (13-15 years old) completed a modified form of the Children's Report of Parent Behavior Inventory. Factor analysis of the data revealed that the adolescent's perception of parental behavior could be described adequately and economically

in terms of the same three basic dimensions, Acceptance *versus* Rejection, Psychological Control *versus* Psychological Autonomy, Firm Control *versus* Lax Control, which were found in previous studies. In order to obtain a more economical description of the results, the data were converted into factor scores of the three basic dimensions. Compared with girls, boys described both parents as being higher on the Firm Control dimension. Compared with boys, girls described both parents as being higher on the Acceptance dimension. Compared with fathers, mothers were described by girls as being more accepting and exercising more psychological control. In all other respects, Hutterite adolescents tended to describe both parents in a similar way.

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PATERNAL ATTITUDES IN HUTTERITE COMMUNAL SOCIETY*[1]

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A. INTRODUCTION

Hutterite society is characterized by a strong commitment to transmit its distinctive and unaltered ideology to future generations (3, 4). There is also a deliberate attempt to make all aspects of colony life—e.g., leadership, family, agricultural production, recreation, decision making, educational institutions, child rearing, etc.—conform to basic Hutterite values. The Hutterite value system is characterized by the following features: (*a*) cooperation rather than competition, (*b*) equal sharing of all goods and the rejection of private ownership, (*c*) "avoiding the world"—that is rejection of the values associated with the surrounding society, (*d*) pacifism and nonviolence in human relationships, (*e*) great respect for the traditional practices established by the "forefathers." The founders of the Hutterite movement—such as Peter Rideman (5), Peter Walpot (13), Andreas Ehrenpreis (1)—emphasized that survival of the Hutterian way of life presupposes effective transmission of Hutterian values to the young. The views of these "forefathers" are still influential because Hutterite preachers do not write their own sermons, but read at the daily worship services sermons that were written by the forefathers. Some of these sermons emphasize that "bringing up children the right way" is the God given responsibility not only of the child's parents but of every adult colony member. Children must be taught self-denial, obedience, "nonresisting love," cooperation, and respect for religion. Parents must not show favoritism to one child for this would be disruptive to social cohesion. Since parents tend to be unusually lenient when rearing their own children, other adults must become involved in the child-rearing process in order to assure uniformity of child rearing within the colony. From its very beginning the Hutterite movement has developed institutions—such as the kindergarten,

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German school, Sunday school, baptism classes—that were designed to socialize children and adolescents in Hutterite values.

Hutterite socialization practices seem to be unusually effective. According to Hostetler (2) the loss of members in Hutterite colonies is low, because the intensive moral indoctrination from an early age on tends to offset the attractions of the outside world. Schludermann and Schludermann (7, 8, 9) have demonstrated that the unique characteristics of Hutterite social organization tended to influence the social role perception of Hutterite children and adolescents. Moreover, the age-sex hierarchy of Hutterite society and the Hutterite socialization practices tended to influence strongly the adolescent's perception of themselves and adults in their society (12). Adolescents tended to accept adult norms and regarded adults as being better than themselves.

The present study was undertaken to investigate the attitudes of Hutterite fathers to various aspects of child rearing. To what extent do paternal attitudes actually reflect official Hutterite values? The investigators were also interested in studying possible changes in paternal attitudes with time and age. This problem was investigated by comparing the attitudes of young and old fathers.

B. METHOD

1. *Subjects*

Seventy-five Hutterite fathers (25 to 69 years of age) who participated in this study came from 20 Hutterite colonies of rural Manitoba. There were 42 young fathers (25 to 44 years) and 33 old fathers (45 to 69 years). The latter were grandfathers as well. The *S*s were contacted one by one and the purpose of the study was explained to them. They could either read the attitude questionaire themselves and check off the answers or they could respond verbally to questions which were read to them.

2. *The Instrument and the Procedure*

The investigators assessed paternal attitudes by a modified form of the Parental Attitude Research Instrument (PARI) for fathers. The original Father's PARI was developed by Schaefer (6). It was a Likert-type attitude questionaire which consisted of 30 scales of eight items each. Schludermann and Schludermann (10) shortened the original Fathers PARI by selecting items and scales on the basis of item reliability and relevance. The shortened and revised version, Fathers PARI-Q1 of 100 items (20 scales × 5 items) seemed to be adequate for assessing paternal attitudes toward child rearing (10). In order to assess and control response biases Schludermann and Schludermann (10, 11) developed a reversed form of the Father's PARI-Q1. In this reversed form (Father's PARI-Q2) each item of Q1 was restated in negative terms.[2] If a subject were logically consistent agreement with any Q1 item implied disagreement with the corresponding Q2 item.

The PARI questionaire was based on the above-mentioned two questionaires Q1 and Q2. In order to discourage the development of response biases and position sets 10 of the 20 scales were taken from Q1 (i.e., Encouraging Verbalization, Harsh Punishment, Deception, Nonpunishment, Strictness, Ascendancy of Husband, Inconsiderateness of Wife, Suppression of Affection, Change Orientation, Forcing Independence) and the remaining 10 scales were taken from Q2, (i.e., Fostering Dependency, Breaking the Will, Marital Conflict, Irresponsibility of Father, Suppression of Aggression, Deification of Parent, Exclusion of Outside Influence, Irritability, Suppression of Sexuality, Complaint of Ascendancy of Wife). Each of the 20 scales contained five items expressing paternal attitudes. The *S* was asked to indicate whether he (*a*) strongly agreed, (*b*) agreed, (*c*) disagreed, (*d*) strongly disagreed with the attitude expressed. For Q1 items the following scoring system was used: agree strongly = 4, agree = 3, disagree = 2, disagree strongly = 1. For Q2 items the following scoring system was used: agree strongly = 1, agree = 2, disagree = 3, disagree strongly = 4. Thus the scoring system took the reversal of some items into consideration and Q1 and Q2 scales should yield comparable information.

In order to assess the strength of aquiescence sets in the expression of paternal attitudes, three scales from Q1 were added at the end of the questionaire: Breaking the Will, Deification of Parent, and Irritability. These scales duplicate three scales taken from Q2. Comparison of scores of the corresponding Q1 and Q2 scales gives an indication about the strengths of aquiescence sets. The three added Q1 scales were not included in the factor analysis.

C. RESULTS

1. *Factor Structure*

The correlation matrix of 20 × 20 scales was factor analyzed by the principal axes method and then rotated according to the *Varimax* criterion. An eigenvalue of 1.2 was used as the criterion as to what factors should be rotated. With that criterion the factor analysis yielded five factors accounting for 52.8% of the total variance. The resulting *Varimax* factors reflected closely the information from the correlation matrix inasmuch as scales with significant loadings (larger than ±.40) on a given factor were the same scales that formed a cluster of moderately high (that is, between ±.30 and ±.50) intercorrelations. These five factors will be described below in terms of those scales that had significant loadings on that factor.

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[2] Revised forms of Q1 and Q2 can be obtained either directly from the authors or from NAPS. Copies of unreversed and reversed forms of Father's PARI have been deposited with NAPS. Order Document No. 01019 from National Auxilliary Publications Service, c/o CCM Information Corp., 909 Third Avenue, New York, New York 10022; remitting $2.00 for microfiche or $5.00 for photocopies.

TABLE 1
FACTOR STRUCTURE OF HUTTERITE FATHERS' PARI

Scales	F_{MD}	F_{AD}	F_S	F_{PR}	F_{PA}
1. Encouraging Verbalization	—.12	—.35	.55	—.06	—.28
2. Fostering Dependence (R)[a]	—.05	—.22	—.10	.06	.20
3. Breaking the Will (R)	.33	.34	.16	—.16	—.01
4. Harsh Punishment	.14	.79	.07	.14	—.61
5. Deception	—.33	.15	—.40	—.12	—.51
6. Marital Conflict (R)	.15	—.06	.59	.21	—.09
7. Nonpunishment	—.63	—.15	—.06	—.01	—.33
8. Irresponsibility of Father (R)	.08	—.06	.12	.81	.12
9. Suppression of Aggression (R)	.45	—.02	—.21	—.51	.46
10. Deification of Parent (R)	.34	—.01	—.06	—.73	.27
11. Exclusion of Outside Influence (R)	.28	.23	—.07	.02	.62
12. Irritability (R)	.01	—.09	.10	.08	.06
13. Strictness	.04	.69	—.20	—.08	—.02
14. Suppression of Sexuality (R)	.09	.08	—.77	—.01	—.13
15. Ascendancy of Husband	—.02	.66	—.32	.03	.19
16. Inconsiderateness of Wife	—.83	.05	—.13	.07	.13
17. Complaint of Ascendancy of Wife (R)	.71	—.01	—.21	.04	.16
18. Suppression of Affection	—.10	.70	.04	—.20	.01
19. Change Orientation	—.15	.32	.38	—.44	—.06
20. Forcing Independence	.05	.17	—.03	.03	—.79

[a] R Indicates reversed scales of Questionnaire 2; for details please see text.

F_{MD}: This factor was composed of the following four scales: Inconsiderateness of Wife, Complaint of Ascendancy of Wife, Nonpunishment, and Suppression of Aggression. The items reflected the attitude generally described as authoritarian style where males are dominant. Therefore, this factor was labelled as the Male Dominance factor.

F_{AD}: Four scales described this factor: Harsh Punishment, Suppression of Affection, Strictness, and Ascendancy of Husband. The items of these scales described a style of discipline that depends on punishment, suppression, strictness and authority: i.e., an authoritarian style. The factor was therefore called Authoritarian Discipline.

F_S: The factor consisted of the following scales: Suppression of Sexuality, Deception, Encouraging Verbalization, Marital Conflict. The first two scales seemed to imply that suppression and deception go together; the last two scales implied that encouragement of verbalization and marital conflict go together. The overall picture was one where suppression is used as a means to enforce order: i.e., discourage verbalization and marital conflict, suppress expressions of sexuality and deception. Therefore, this factor was called the Suppression factor.

F_{PR}: The following scales described the factor. Irresponsibility of Father, Deification of Parent, and Change Orientation. The scales indicated an attitude which emphasized responsibility of the father, parent deification by children, and no change in orientation. On the whole, the attitude reflected was one of paternal responsibility and supremacy of paternal authority. The factor was labelled as the Paternal Responsibility factor.

F_{PA}: The factor was described by the following scales: Forcing Independence, Exclusion of Outside Influence, Deception, and Suppression of Aggression. The scales described a mode of control through the use of force, restriction of outside influences, and suppression of open aggression and deception. The means of control were descriptive of authoritarian power assertion. Therefore, this factor was called the Power Assertion factor.

These five factors suggested that the pattern of attitudes of Hutterite fathers could be described in terms of five basic dimensions. Comparison of the factor structure with clusters of moderately high intercorrelations of the correlation matrix indicated that there was some overlapping relationship between the Male Dominance (F_{MD}), the Suppression (F_S), the Paternal Responsibility (F_{PR}), and Power Assertion (F_{PA}). Some scales on one factor showed moderate correlations with scales on another factor. On the other hand, the Authoritarian Discipline factor (F_{AD}) showed no overlap with any of the four factors.

2. *Comparison Between Young and Old Fathers*

In order to study the stability of paternal attitudes across two generations the Hutterite *S*s were divided into young fathers (ages 25 to 44 years) and old fathers (ages 45 to 69 years). The old fathers formed an age group, who could be also grandfathers and all of them did have grandchildren. For each of the two age groups and for each of the 20 scale scores the means and standard deviation were calculated. Differences in mean scale scores between young and old fathers were examined by *t* tests (Table 2).

No significant differences between age groups were observed on 16 of the 20 scales. The four scales on which there were significant differences ($p < .05$ to .01) were Deception, Marital Confiict, Exclusion of Outside Influence, and Complaint of Ascendancy of Wife. On the whole, the results indicated

TABLE 2
DIFFERENCES IN MEANS BETWEEN YOUNG AND OLD HUTTERITE FATHERS

Scales	Young fathers $\overline{X}$	Young fathers *SD*	Old fathers $\overline{X}$	Old fathers *SD*	Y *vs.* O *t* test
1. Encouraging Verbalization	10.6	3.0	11.7	2.6	—1.67
2. Fostering Dependency (R)[a]	10.7	2.4	10.0	2.8	1.06
3. Breaking the Will (R)	11.5	2.8	11.3	3.1	0.33
4. Harsh Punishment	14.3	3.6	14.6	3.8	—0.43
5. Deception	9.9	2.9	11.5	3.8	—2.00*
6. Marital Conflict (R)	10.1	3.3	8.2	2.8	2.72**
7. Nonpunishment	8.8	2.7	9.3	3.0	—0.81
8. Irresponsibility of Fathers (R)	8.1	2.0	7.5	2.6	1.26
9. Suppression of Aggression (R)	14.3	2.4	13.2	3.0	1.58
10. Deification of Parent (R)	13.4	2.8	13.1	2.6	0.45
11. Exclusion of Outside Influences (R)	12.6	2.2	11.2	3.2	2.13*
12. Irritability (R)	9.1	2.7	9.8	3.3	—0.86
13. Strictness	17.0	2.4	17.3	2.5	—0.54
14. Suppression of Sexuality (R)	14.4	3.3	14.9	2.7	—0.80
15. Ascendancy of Husband	17.8	2.5	18.0	2.6	—0.38
16. Inconsiderateness of Wife	12.0	2.7	13.3	3.4	—1.82
17. Complaint of Ascendancy of Wife (R)	15.0	2.5	13.5	3.0	2.35*
18. Suppression of Affection	17.4	2.5	17.8	2.9	—0.57
19. Change Orientation	16.8	2.3	17.3	2.7	—0.80
20. Forcing Independence	12.4	2.7	13.1	3.2	—1.06
21. Breaking the Will[b]	13.1	3.7	14.5	3.5	—1.59
22. Deification of Parent[b]	16.4	3.1	17.0	3.4	—0.85
23. Irritability[b]	8.5	2.6	11.4	4.2	—3.49

* $p < .05$.
** $p < .01$.
[a] Scales marked with (R) are reversed scales from Q2, the other scales are unreversed scales from Q1.
[b] These scales from Q1 duplicate scales 3, 10, and 12 taken from Q2.

a high degree of agreement in paternal attitudes between fathers and grandfathers.

Comparison of means of the last three scales—i.e., 21, 22, 23; these were the three Q1 scales that duplicated three Q2 scales—showed that only one scale (i.e., 23) showed significant mean differences between young and old fathers. On that scale the old fathers showed a greater aquiescence set than the young fathers. Comparison of the corresponding Q1 and Q2 scales—that is, scales 21, 22, 23 with scales 3, 10, 12, respectively—suggested that aquiescent sets did modify to some extent the expression of paternal attitudes by Hutterite fathers.

D. DISCUSSION

Male Dominance, Authoritarian Discipline, Suppression, Power Assertion, and Paternal Responsibility were the dimensions that provided a meaningful structure of the Hutterite fathers' attitudes toward child rearing. These five factors represented independent and basic attitudinal dimensions along which Hutterite fathers differed from each other. The paternal attitude of a given Hutterite could be described meaningfully in terms of the degree to which he asserted Male Dominance, Authoritarian Discipline, Suppression, Power Assertion, and Paternal Responsibility.

On the substantive level, both young and old fathers tended to approve strongly of strictness, suppression of affection, ascendancy of the husband, and change orientation. On the other hand, they tended to disapprove strongly of nonpunishment, irresponsibility of the father, and irritability. The general picture which emerges from this pattern of strong approval and strong disapproval is one of authoritarian attitudes toward child rearing. Hutterite fathers seemed to be aware not only of their roles as strict disciplinarians, but also as males who must dominate and be responsible. These authoritarian attitudes of Hutterite fathers were in line with the highly patriarchal power structure of Hutterian society.

The expressed attitudes of young fathers were very similar to the expressed attitudes of old fathers. In studies of paternal attitudes in modern Western society one usually observes a considerable "generation gap" between the opinions of grandfathers and young fathers. Among Hutterites there appeared to be no obvious generation gap. The close agreement between the attitudes of young fathers and grandfathers suggested that Hutterite socialization practices are very effective in transmitting values from one generation to the next.

E. SUMMARY

Seventy-five Hutterite fathers completed the Father's Form of Parental Attitude Research Inventory. Factor analysis of the results suggested that paternal attitudes could be described in terms of five dimensions: Male Dominance, Authoritarian Discipline, Suppression, Paternal Responsibility, and Power Assertion. In general, Hutterite fathers expressed strongly authoritarian attitudes toward child rearing. There were only slight differences in paternal attitudes between young and old fathers.

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RECOGNITION PAIRED-ASSOCIATE LEARNING IN PRESCHOOL CHILDREN*[1]

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A. INTRODUCTION

Paivio's (6) conceptual-peg hypothesis suggests that the image evoked by the stimulus item in a paired-associate learning (PAL) task serves as a "peg" for the storage and retrieval of the response item. Thus, if a stimulus strongly evokes an image, as would be predicted for concrete nouns and pictures of common objects, retrieval of the response item would be facilitated. With adult *S*s Paivio and Yarmey (7) varied concreteness on both the stimulus and response side of PA lists by using pictures and their concrete noun labels (words) in a factorial design. Pictures were superior to words, and the effect was greater on the stimulus side of the paired-associates. In fact, a P response produced a decrement in responding, since picture-word (P-W) pairs were superior to picture-picture (P-P) pairs. When Dilley and Paivio (3) used small children as *S*s, they found that the preschoolers in the P-W condition showed better retention than the children in the W-W or P-P condition, with the greatest number of errors occurring in the W-P condition. Although the conceptual-peg hypothesis predicted the superiority of the conditions where the stimuli were pictures, the superiority of the P-W condition over the P-P condition had not been deduced from Paivio's original formulation (6).

Although no fully satisfactory explanation has been suggested for the superiority of the P-W condition over the P-P condition, the most parsimonious explanation suggests that the observed difference is an artifact of the experimental procedure used by Paivio and his associates. In short, since

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Paivio used the conventional anticipation PAL technique, his *S*s were required to make a verbal response under all conditions. Thus, the P-P condition was really a P-P-W condition, since, given the stimulus, *S* must not only retrieve the response item, but must go through the additional transformation of providing a verbal label (decoding) for information that had originally been stored visually. Despite adequate response availability, the additional transformation required in the P-P condition is presumably a more elaborate process than the process required in the P-W condition where the information is initially stored in the verbal form (2, 4).

In order to do away with *S* verbalizations in those conditions that are purportedly nonverbal and, thus, provide a fairer test of hypotheses that compare the effects of exposure to picture and word stimuli, Jenkins *et al.* (4) used a variation of a recognition technique employed by Mink (5). A list consisting either of pictures (P) or their noun labels (W) was presented to adult *S*s. Following the training phase, a test list was presented that consisted of the original stimuli and stimuli that had not previously been used in training. The *S*'s task was to mark a five-point scale to rate his confidence that each stimulus presented during the test phase had been presented in the original training list. The results indicated that the P-P condition was superior to the W-W and P-W condition, with all groups superior to the W-P condition. These results suggest that the explanation provided by Jenkins *et al.* (4) represents an oversimplification of a very complex problem, and that further research is necessary.

Although the recognition procedure used by Jenkins *et al.* (4) does not require *S* to make a transformation from a visually stored image to a verbal label, a PAL technique may be preferred to a recognition technique by many investigators (9). Davidson and Adams (2) have presented data based upon a procedure developed by Davidson (1) that combines a modified PAL procedure with a recognition task. Under the conditions of the recognition PAL task, no verbalization was required from *S* who was shown 20 transparencies of paired pictures exposed by overhead projector. For the test phase, only the stimulus pictures were projected, and *S* was instructed to circle the response member for each stimulus on an answer sheet which pictured all possible response members.

Although Davidson's procedure (1) is likely to be acceptable to those investigators who require a PAL task to test hypotheses in the area of learning and retention, the procedure is not, without considerable modification, appropriate to preschool children who are likely to find the procedure and instructions confusing. Since the preschool child is so often the target for studies of cognitive development, the present report describes a recognition PAL procedure that does not require explicit transformation from a visually stored image to a verbal label and that may be the method of choice when a task is required that is appropriate for young children.

B. METHOD

1. *Stimulus Materials*

Twelve pictures of common objects were drawn on 4 × 6 inch poster board squares. The drawings were sufficiently detailed to avoid ambiguity and were finished with bright poster paint. Stimulus-response (S-R) slides were produced by photographing two of the pictures, side by side and connected with a yellow double headed arrow, on a large black field; stimulus (S) slides were produced by photographing one of the pictures, on the left side of the field next to the arrow, leaving a blank area on the right side of the larger black field. Thus, there were two types of slides, the stimulus-response (S-R) slide used for initial training and the stimulus only (S) slide used for the later training-recognition trials. Each of the 12 original 4 × 6 inch pictures was enclosed in a plastic cover for use during the recognition test. The verbal labels for the stimulus and response cards used in the present study are listed in the order presented: boy-girl, hammer-telephone, car-truck, fish-wagon, butterfly-boat, ball-flag.

2. *Apparatus*

A Carousel slide projector was placed on a table, 48 inches from a 18 × 18 inch Polacoat screen mounted in a shielded wooden frame. With rear projection, good reproduction of the original stimulus material was possible without darkening the room. The size of the projected image of each of the 12 items was precisely the size of the corresponding plastic covered card, 4 × 6 inches.

3. *Subjects*

The *S*s were six boys (49 months to 53 months at the time of original testing) and eight girls (48 months to 55 months at the time of original testing) from the San Fernando Valley State College Preschool laboratory. This was one of a series of "games" in which the children volunteered to participate.

4. *Procedure*

All *S*s were familiar with the experimental room and the experimenter who had established a scrapbook for each child consisting of his own photo-graph and colored paper stickers of animals that were given to *S* to paste in his scrapbook each time he completed a "game." During an earlier session, every child was shown each of the stimulus cards and asked to name it. All *S*s were able to name every card without difficulty.

The children were told that they were going to play a game called "Goes With." The projector was then turned on and *E* advanced the projector to expose the first S-R pair, boy-girl. The *E* then said, "in this game boy always goes with girl and girl always goes with boy." The *E* pointed at the image of the girl on the screen as she said "girl," pointed at the double headed arrow as she said "goes with," and pointed at the boy as she said "boy." As *E* continued the preliminary instructions, the set of six response cards was arranged in random order on the table in front of the projection screen and at *S*'s eye level. The *E* then said "hand me the picture that goes with the boy." *E* then took the picture from *S* and held it up to the screen, next to and in front of the projected image of the boy, and then returned the picture to the table. This procedure took less than 10 seconds per pair. The procedure was repeated for all the paired-associate items with *E* encouraging the child to respond briskly, to attend, and to generalize from the card to the projected image of the card. The training phase was followed immediately by the test phase. In all test trials *S* was shown a slide consisting of the stimulus item and the yellow arrow (S slide) and was asked to choose the correct response item from the six response cards on the table in front of him. If *S*'s response was incorrect, *E* said "let me show you the picture that goes with boy." *E* then picked up the correct card and held it in place and said, "boy goes with girl and girl goes with boy." The child was praised for correct responses. The procedure was repeated for a total of four trials.

Approximately four weeks from the date of original learning, *S*s were brought back to the same room for Phase 2. All of the conditions were the same as in Phase 1. As soon as the child was adapted to the situation, *E* said, "Do you remember the game we played called Goes With? Today, we are going to play that game again. I will show you only one picture, and you hold up the card that goes with the picture." Only S slides were used for Phase 2, but the procedures were otherwise identical to those followed during the original session. Four trials were scored for each child as in Phase 1.

C. RESULTS AND DISCUSSION

The number of errors made by each child on each of the trials was recorded, and the results for the four trials in Phase 1 and four trials in Phase 2 are presented in Table 1.

TABLE 1
TOTAL NUMBER OF ERRORS FOR EACH OF THE FOUR TRIALS OF PHASE 1 AND EACH OF THE FOUR TRIALS OF PHASE 2 FOR EIGHT GIRLS AND SIX BOYS

	Trials				
Subjects	1	2	3	4	Total
		Phase 1			
Girls	16	7	5	8	36
Boys	12	13	12	14	51
Mean	2.0	1.4	1.2	1.6	6.2
		Phase 2			
Girls	12	7	5	5	29
Boys	11	6	10	10	37
Mean	1.6	.9	1.1	1.1	4.7

A 2×2 analysis of variance indicated that the differences between the mean number of errors on the first trial of Phase 1 (2.0) did not differ from the mean number of errors on the first trial of Phase 2 (1.6) for either the boys or the girls. The mean number of errors in Phase 1 (6.2) was significantly greater than the mean number of errors in Phase 2 (4.7), $F\ (1, 12) = 5.06, p < .05$. Thus, measured by a savings score, there was some evidence of retention after a full month. Although the boys tended to make more errors than the girls in both phases, the difference was not statistically significant, $F\ (1, 12) = 3.43, .05 < p < .10$.

Errors on the two associatively related pairs, boy-girl and car-truck, were rare (only one error for all *S*s over eight trials), suggesting that varying the normative association strength (8) between paired items may provide an adequate means of varying difficulty level of the task while keeping constant number of items and amount of time in contact with *E*.

The procedures discussed in this report are being altered as research with the recognition PAL task proceeds. The amount and kinds of verbalizations made by *E* during training and test are crucial. It seems apparent that more verbalizations were used by *E* than are necessary or appropriate for a P-P condition. In future studies pictures will not be labeled by *E* when a P-P condition is undertaken. Another avenue of inquiry which is now being pursued is a method whereby an unambiguous recognition PAL W-W condition can be employed with preschool children.

D. SUMMARY

Paired-associate learning (PAL) is differentially affected when pictures or their verbal labels are used on the stimulus side or on the response side of

PA lists. Conflicting results from recent studies suggested the need for a modified PAL procedure where *S*s are not required to provide verbal labels for information that had originally been stored visually. Although Davidson's (1) recognition PAL procedure is appropriate for adults and older children, no comparable procedure is available for preschool children. A recognition PAL task is discussed that can be used to test hypotheses when the target population is from 3 to 6 years of age.

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PERFORMED ACTIONS AS DETERMINANT OF HORIZONTAL DECALAGE IN A LOGICAL STRUCTURE: I. THE QUANTITATIVE ASPECT*[1]

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A. INTRODUCTION

"Decalage horizontal" is the subject's mastering of one task, but not another which is formally identical to the first. Piaget (10, p. 51) specifies this as follows: "It is not an instance of a decalage between different operational groupings, but between the same groupings relating to different contents." The phenomenon thus signifies a developmental heterogeneity.

The best known instance of horizontal decalage is the time lag observed in the development of conservation of substance and weight (13). The developmental relationship of these concepts is explained by genetical primacy (10), deduced from the logical interdependence of the concepts' precursors in concrete action. Without the contrary being possible, "to carry and weigh with the hand" (concrete precursor of weight-conservation) implies "to retrieve" (concrete precursor of substance-conservation).

Now, observations of developmental heterogeneity are common in the rapidly growing literature on operational problem-solving [for one review, see (4)]. As inter- and intratask variability of varying degrees, these may as well be masked decalages as performance oscillations. In many such instances, however, a genetical primacy based on a deduction from the logical interdependence of precursors in concrete action seems an improbable, and even impossible, explanation. This also holds true in the Genevan research. In at least one instance (6), the subject's history of virtually performed actions is used as explanation, without there being established any logical necessary genetical primacy.

If virtually performed actions make a difference, then number of performed

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actions should be an important determinant of horizontal decalage. Assumptions in this direction, though less specific as "experience," are also made by Beard (1), Dodwell (2), Ervin (3), Kofsky (7), Kohnstamm (8), and Uzgiris (14). This has not, except for Kohnstamm (8), been the basis of predictions.

B. THEORETICAL BACKGROUND

The present assumption has a direct connection to the Piagetan theory of the development of logical structures. These are conceived of as results of interiorized action-coordinations (e.g., 5, 11) structured to a form according to certain criteria, among which reversibility is the most important and best known (e.g., 10).

The structure is called "grouping," and has as its content the concrete objects that are the object of a given problem (12). When these groupings are newly developed in children between 6 and 8 years of age (the concrete-operations stage), there is no perfect differentiation between the structure and its content.

This imperfect differentiation implies that certain contents become objects of a grouping earlier than others. Piaget's stressing the concrete construction of objects as preliminary to their insertion into a conceptual structure (by a decentration process based on a large amount of "centrations," or behaviors *vis a vis* the objects) actualizes the assumption that the performing of actions has, eventually, the differentiation as an effect. Horizontal decalage should, therefore, be demonstrated when the same operational grouping has bearing on two object-assemblies that differ in the number of actions subjects have performed on them.

C. HYPOTHESIS

This can be stated in the following hypothesis: "A majority of subjects who solve one of two problems (i.e., show decalage) solvable only operationally, and stated in two different contexts—(*a*) objects the subjects know, and on which it is highly probable they have performed actions, and (*b*) objects the subjects know, but on which it is improbable they have performed actions—will solve the problem in context (*a*), and not in context (*b*)."

Kohnstamm (8) found no evidence for a similar hypothesis, but his criteria are severely questioned by Pascual Leone and Bovet (9), whose critique also pertains to the Dodwell (2) study.

D. METHOD

1. *General Design*

To test the hypothesis, we employed a collection of toy cars as context (*a*), and a collection of miniature birds as context (*b*). The experiment was in two sessions, with an interval of about a week. The experimental sessions were exactly alike, except for the experimental objects.

*S*s were all boys, and the prediction was that a problem involving cars is easier to a group of boys than the same problem involving birds (the ordinary boy's customary play and interests in mind).

We chose the quantification of the inclusion relation as the demonstration problem, and made the Inhelder and Piaget study (6, chap. IV) the model of our experiment.

We state that a child masters the quantification of the inclusion relation when he demonstrates the understanding that a superordinate class "B" contains several subordinated classes "A*" and "A," and that B is larger in scope than each of the subordinated classes.

2. *Subjects*

One hundred seventeen boys, 7 to 8 years (mean 7-6) of age, from the first grade in two elementary schools in Oslo, served as subjects.

3. *Experimental Conditions, Designations, and Materials*

For an overview, see Table 1.

There was a total of 16 objects in every condition, eight of these of the same type, and four out of the eight of the same color. Marked capitals designate the subordinate class employed in testing the inclusion-quantification. The inclusion sequence was $A^* \ (N = 4) < B \ (N = 8) < C \ (N = 16)$.

The splitting of the toy-car condition was accomplished to make possible a control of the possible effect of a name-familiarity factor proposed by

TABLE 1
AN OVERVIEW OF THE EXPERIMENTAL CONDITIONS, THE DESIGNATIONS, AND THE MATERIALS

Cond. 1	Cond. 1*	Cond. 2	Number	Designations
White VWs	White Piagets	White ducks	4	A*
Various VWs	Various Piagets	Various ducks	4	A
VWs	Piagets	Ducks	8	B and B*
Various cars	Various cars	Various birds	8	B
Cars	Cars	Birds	16	C

Kohnstamm (8) as an alternative determinant to performed actions. The eight VWs (Volkswagens) were therefore, for half the *S*s, replaced by eight cars that were not characteristic of any well-known type. These were named "Piagets."

While all the boys knew the VWs, many designated the collection "ducks" as "swans," "geese," "ducklings," and the like. We used the child's designation in the subsequent questions.

4. *Criteria and Scoring*

To be credited as "mastering the quantification of the inclusion relation," the *S*s had to give a correct answer to nine questions. There were two main types of questions, the second given in two forms:

1. "Are there more A* or more B in the world (position of the terms were varied)?"

2. (a) "If all the B in the world died (birds)/burned out (cars), were there any A* left?"

(b) "If all the A* in the world died/burned out, were there any B left?"

These questions were asked for each of the three inclusion relations (A* *vs.* B, B* *vs.* C, and A* *vs.* C). A correct response-sequence was "B-yes-no-C-no-yes-C-yes-no." The probability of succeeding by chance is about 2 o/oo.

*S*s who had only one wrong answer after the whole sequence of questions was asked were given one more trial with this question. This was thought a reasonable device against occasional lapses of attention, or some small misunderstanding of one kind or another.

The answers were scored "right" or "wrong."

5. *Procedure*

E attended a school-hour in the children's classroom some days before the first session, to make the *S*s familiar with him. It was the same *E* in all experimental conditions.

The *S*s had condition 1 *or* 1*, *and* condition 2. The presentation of the conditions was randomized within the sample.

The *S*s were taken one by one out of the class to a neighboring room. The instruction was "Now I am going to show you something, then I will ask you something, and you must try to answer what you think."

When entering the room, the *S*s were asked to tell the name of the objects, which were spread out on a table beforehand. They were then to find objects which were of the same type (B), and to place these together (this is a mild antioperational, suggestive device sharpening the method as discriminative tool). Next, the *S*s were asked if they would include two pointed-at objects if they were to place all the C together. They were also asked to count first C, then B, both before and after the criteria questions. *E* did this to have a check on the stability of the classifying activity in the different conditions.

The *S*s were seated facing *E* with the objects to the right of them when the criteria questions were asked. *E* appealed to the *S*s to look at him while the questions were read, but they were not prevented from glancing at the objects every now and then.

The questions were read as many times as appeared necessary, twice each being the minimum. The *S*s were asked to make an effort to find the answers. *E* tried to be neutral, but encouraged those that showed signs of anxiety. Qualifying feedback was not given.

To prevent remembering the criteria questions, the *S*s were given five trials with a short poem at the end of the first session. They were given the impression that this was the real purpose of the experiment.

E. Results

1. *The Hypothesis*

In Table 2, the scoring that is relevant to the hypothesis is found under "Total." As it might be assumed that the decalage is an effect of the order of presentations, Table 2 also shows the distribution of scores in the two experimental sessions.

TABLE 2
Distribution of Scores for Subjects Who Have Mastered One Condition ($N = 25$)

Conds. mastered and not mastered	Total	Session 1	Session 2
1, not 2	11	4	7
1*, not 2	10	4	6
1 or 1*, not 2	21	8	13
2, not 1 or 1*	4	2	2
Total	25	10	15

Table 2 shows that 25 *S*s mastered one out of two conditions (showed horizontal decalage). Of these, 21 *S*s (84%) mastered condition 1 or 1*, while only four *S*s (16%) mastered condition 2. This difference is in the predicted direction, and is significant far beyond the 1% level as calculated from the binomial distribution.

As there is, in fact, no difference between the scores in conditions 1 and 1*, these conditions are treated as one.

There is some evidence that the second session was somewhat easier than the first, as the scoring frequency for the two sessions was, respectively, 15 and 10. But the difference is not significant, and this effect cannot account for the observed decalage.

To have a fair view of the effect of name familiarity and the order of presentation, one must, however, inspect the scoring frequency for the whole sample.

2. *Other Factors*

Table 3, which encompasses all the *S*s who have scored to the criterion, shows a very small difference between conditions 1 and 1*. This, in line with data from Table 2, points to name familiarity as an unimportant determinant in this respect.

TABLE 3

THE PERCENTAGE SCORING FREQUENCY OF THE WHOLE GROUP IN THE THREE CONDITIONS, ON THE TWO SESSIONS, AND TOTALLY

Conditions	Session 1	Session 2	Total
1	37, 9 ($N = 29$)	37, 9 ($N = 29$)	37, 9 ($N = 58$)
1*	36, 7 ($N = 30$)	24, 3 ($N = 29$)	30, 5 ($N = 59$)
1 and 1*	37, 3 ($N = 59$)	31, 0 ($N = 58$)	34, 2 ($N = 117$)
2	12, 1 ($N = 58$)	27, 1 ($N = 59$)	19, 7 ($N = 117$)
Total	24, 6 ($N = 117$)	29, 1 ($N = 117$)	27, 4 ($N = 234$)

The notable differences are, the predicted ones set aside, between the sessions in conditions 1* and 2. However, no significances are calculated, since the differences are in opposite directions, and an explanation is suggested in the following data: 42, 1% of those who mastered both conditions had conditions 1* + 2; 87, 5% of these had the experimental sequence 1*-2. This extreme distribution of subjects that have mastered both conditions must be partly (and perhaps mainly) incidental, and partly due to a second-session effect.

By way of conclusion, while it seems wise to allow for at least some effect of the order of presentations, this can not be an alternative explanation of the observed horizontal decalage. The scores in session 1, Table 2, sustain this.

F. DISCUSSION

The horizontal decalage observed in this experiment was in a direction predicted from Piaget's theory as a basis. For the prediction, performed actions were counted upon as determinant of this decalage.

An alternative to the "performed-actions" hypothesis might be that the observed decalage is a consequence of the *S*s having less literal knowledge of the birds than of the cars. This finds some support in the global impression of the classifying activity; the *S*s seemed to identify the cars with greater ease and self-assurance than the birds. But a closer inspection of the classifying activity gives little additional support for this point of view.

Practically all the subjects in all conditions classified B correctly; the same was true for the counting. That is, B was included when the *S*s were told to count C.

The question "If you were to place all the C together, would you take these, too?" educed 30 wrong answers in conditions 1 and 1*, and 24 in condition 2.

Furthermore, a direct illustration of the relation between literal knowledge and the ability to act operationally is the following observation: Of those who responded incorrectly to the above-mentioned question, 20% of *S*s in conditions 1 and 1*, and 17, 3% of *S*s in condition 2, nevertheless scored to the criterion in those conditions; and of the 13 *S*s who did not know the name "birds," three scored to the criterion in condition 2.

One must conclude, then, first that the *S*s did not seem to know (meaning "literally know") the cars much better than the birds; second, that literal knowledge does not seem to be directly related to an inferred structure which implies mastering of the quantification of the inclusion relation.

The fact that the observed decalage was predicted from the Piagetan theory attests to a correspondence between the phenomenon of horizontal decalage and the general theory. This relationship can, therefore, not be looked upon as asynchronous, as implies Wohlwill (16). Moreover, it is probable that much of what has been considered as heterogeneity of development is reducible to the phenomenon of horizontal decalage. As such, heterogeneity can hardly be an "Achilles-heel" in the Piagetan theory (15), but rather an expected consequence of it.

G. SUMMARY

A group of 7- to 8-year-old subjects were confronted with the same logical problem in two different contexts. As hypothesized on the basis of the Piagetan theory, a majority of those who solved the problem only once (showed horizontal decalage) solved it in a context that was known to them by performed actions.

It is argued that the phenomenon of horizontal decalage is an expected consequence of the Piagetan theory, and that it can be an explanation of various developmental heterogeneities taken as critique of that theory.

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RELATIONSHIP BETWEEN KINESTHETIC AND SPIRAL AFTEREFFECT AND EYSENCK'S THEORY OF PERSONALITY*

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A. Introduction

Eysenck showed that hysterics (as prototypes of extraverted personality) reflected greater kinesthetic figural aftereffect (KFAE) than dysthymics (as prototypes of introverted personality). He stated further that hysterics record shorter spiral aftereffect (SAE) than dysthymics (2). Since Freedman, Webster, and Sanford (3) found negative correlation between authoritarianism and the Minnesota Multiphasic Inventory (MMPI) hysteria scale, the implications of Eysenck's theory were extended to the authoritarian-nonauthoritarian dimension to show that (*a*) authoritarians reflect longer SAE than nonauthoritarians and (*b*) they generate poorer KFAE than nonauthoritarians (6, 7). In terms of Eysenck's theory, then, it is hypothesized that a negative correlation will be found between KFAE and SAE such that an increase in KFAE scores will accompany a decrease in the degree of authoritarianism and, conversely, an increase in SAE scores will accompany an increase in the degree of authoritarianism.

B. Method

1. *Subjects*

A measure of authoritarianism (6) prepared by the author was administered to 400 postgraduate students of Banaras University. Fifty high scorers (28 males and 22 females), called authoritarians, and 48 low scorers (24 males and 24 females), called nonauthoritarians (i.e., $+1\ \sigma$ and $-1\ \sigma$, respectively, in the distribution) served as subjects.

2. *Materials*

a. For KFAE experiment. The apparatus consisted of the following wooden blocks made of unpainted hardwood: (*a*) inspection block (width 55 mm), (*b*) test block (width 35 mm), and (*c*) comparison scale (width 5 mm at the top to 63 mm at the bottom).

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b. For SAE experiment. A four-throw spiral in black on a white background was enlarged on a disc with a diameter of eight inches (5, p. 77). The disc was rotated on a motor in a clockwise direction with a speed of 81 rpm.

3. *Procedure*

a. For KFAE experiment. The procedure was the same as described by Klein and Krech (4) and later adopted by Eysenck (1). The testing sequence was, however, different and is summarized as follows: (*a*) prestimulation condition (four trials) and (*b*) stimulation condition—15, 30, and 60 seconds (four trials each).

b. For SAE experiment. The testing sequence in this experiment consisted of stimulation conditions of 15, 30, and 60 seconds with five trials in each. The procedure is described in detail elsewhere (5).

C. RESULTS AND DISCUSSION

Means for KFAE/SAE scores under each condition—15, 30, and 60 seconds in each of the four groups, respectively—are as follows: 10.68/9.43, 14.39/13.02, and 17.94/17.67 for authoritarian males; 10.62/10.06, 12.70/14.30, and 14.33/17.06 for authoritarian females; 20.74/7.29, 24.70/10.99, and 29.17/14.14 for nonauthoritarian males; and 18.03/6.78, 22.57/9.19, and 26.22/12.17 for nonauthoritarian females. A comparison of means between authoritarian males *vs.* nonauthoritarian males and between authoritarian females *vs.* nonauthoritarian females in both KFAE and SAE tests revealed significant differences at .01 levels. Further, the scores of KFAE and SAE tests correlated with the measure of authoritarianism in expected directions—being negative with KFAE and positive with SAE. However, these four groups varied considerably with the degree of relationship.

Given the above results, the contention of Eysenck was tested by use of product-moment correlations between KFAE and SAE scores of subjects in each group. As stated earlier these should give a negative index in each group if the interpretations of his theory are tenable. Out of 36 correlations between KFAE and SAE conditions—nine for each group—the majority of these was inconsistent and none could reach the .05 level of significance. Thus it remains to be seen if an explanation to relate KFAE and SAE can be made in the way Eysenck has done with reference to personality.

D. SUMMARY

The amount of kinesthetic and spiral aftereffect of 50 authoritarians and 48 nonauthoritarians was obtained, and statistical analysis yielded significant

differences between these two groups. But the relationship between the two aftereffects was found to be inconsistent and vague. The results do not support Eysenck's theory of personality with reference to authoritarianism.

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EFFECTS OF NONCOMPETITIVE, COMPETITIVE INSTRUCTIONS, AND SEX ON PERFORMANCE IN A COLOR-WORD INTERFERENCE TASK*

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A. INTRODUCTION

Stein and Langer (7) tried to relate cognitive interference on a color-phonetic symbol test with personality characteristics and adjustment of *S*s. Their results indicated that there was an association between test performance and certain aspects of personality and adjustment.

Another study utilizing cognitive interference was that of Dalrymple-Alford (1). It was found that interlingual interference affected performance on a color-word performance task. The interlingual variable affected the cognition of the task.

Sarason (4, 5), and Sarason and Palola (6) showed a relationship between instructions given *S*s, the effects of different forms of instructions on anxiety level, and verbal performance. Results suggested that different instructions can lead to different levels of performance. They also indicated differences in performance between females and males.

Peretti (3) found different cross-sex and cross-educational level performances on a color-word interference task among elementary, high school, and college *S*s. Although the results were significant for various reasons, one factor, not considered, but possibly relevant was that of competition. Females, rather than males, might be more competitive, at all levels. Especially in the upper levels, this might be assumed to be due to their concern with dress, appearance, and "doing the right thing."

Hannah and McCormick (2), using competitive and noncompetitive paired association lists, found that the *S*s performed better under the former listing than under the latter. Competition, or its assumed presence, tends to affect performance. Both females and males increased performances with the use of the competitive list.

The present paper considered the performance of *S*s on a color-word interference task, with both sex and competitive levels as variables. It attempted

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to find out if there were differences in performance based on sex differences, as well as on competition.

B. METHOD

1. *Subjects*

A total of 100 students (50 females and 50 males) randomly selected from the freshman class at St. Procopius College, Lisle, Illinois, served as *S*s. These individuals ranged in age from 17 to 21 years of age.

2. *Materials*

Two charts were used in the course of the test; each one constructed on 24 × 30 inch posterboard. The first chart consisted of 60 colored question marks, randomly ordered, using six colors: red, green, blue, yellow, brown, and black. This chart was used to examine the *S*s for possible color-blindness.

The second chart contained the 60 color-words used as the stimulus in the experiment. Each word was the name of a color, but the color of each was different from the name. *S*s had to name correctly the colors and ignore the word names.

3. *Procedure*

Twenty-five of the females and 25 of the males were given noncompetitive instructions when they appeared for the color-word interference test, while the remaining 25 females and 25 males were given the competitive instructions.

Noncompetitive instructions included the following

> You are to name the color of these words, and not the name of the word. Read each color across the rows from left to right. Continue to say the color of each word in each row until you finish the whole chart. If you make a mistake, go back and correct it. Read the color as fast as possible. *You are not* competing with others and your score will not be compared with them. Any question? . . . Are you ready? . . . Begin!

Competitive instructions were the same as those above except that the words "*You are not* competing . . ." were replaced by the words "*You are* competing . . ."

Each of the *S*s in each group was tested individually in an office which was well lighted and relatively free of noise and other distractions. The *S* sat at a desk facing the researcher who presented the two charts to him. All of the *S*s were first shown the chart with the colored question marks at which time they were required to say the colors correctly.

Each *S* was then shown the second or stimulus chart and randomly given either the noncompetitive or competitive instructions. These instructions were randomized so that 25 females and 25 males received the noncompetitive; 25 females and 25 males received the competitive. Although randomized in their presentation, there was a limitation of presentation based upon their nature and the sex of the *S*.

As soon as the *S* began to read and say the first word on the stimulus chart, a stopwatch was begun in order to check his time. The watch was stopped as soon as the *S* finished saying the final word on the chart.

C. RESULTS

Given the noncompetitive instructions, the female *S*s had the shortest mean time to read all of the color-words when compared to the males. The mean time in seconds for the former *S*s was 51.6 seconds, while the *S*s of the latter group had a mean time of 56.8 seconds. All of the *S*s under the noncompetitive condition had a mean recorded time of 54.2 seconds.

Given the competitive instructions, the females had a mean time of 45.2 seconds, while the males had a mean time of 53.4 seconds. The mean time for the combined *S*s in this condition was 49.3 seconds. As can be noted, the females, again, performed with the shorter mean time in reading the color-words when compared to the male *S*s.

There was a significant difference in performance between the females and males given the noncompetitive instructions ($t = 2.943$, $p < .01$); between the females and males given the competitive instructions ($t = 5.798$, $p < .001$), and, when combining the data according to the form of instruction rather than sex, between all of the *S*s receiving the noncompetitive instructions and those *S*s receiving the competitive ($t = 4.588$, $p < .01$).

While sex was held constant, performance was compared, and it was found that there was a significant difference in the mean times between females who received the noncompetitive instructions and the female *S*s who received the competitive ($t = 2.675$, $p < .05$). No significant difference ($t = 1.855$, $p > .05$) was found between the male *S*s given the noncompetitive instructions and those given the competitive one.

D. CONCLUSIONS AND DISCUSSION

With the instructions held constant, the effects of noncompetitive instructions on the female and male *S*s was considered; and it was found that the women had a significantly faster performance time when compared to the men. Then, with the instructions held constant, the effects of the competitive form on the female and male *S*s were considered, and the women again were found to have the significantly faster performance time. Under the influence of the competitive instructional condition, however, the differences between the sexes in performance was greater than under the noncompetitive condition. Competitive instructions enhance performance for both men and women, when compared to the noncompetitive, and the increase is greater for the females.

Sex of *S* was held constant while consideration was given to performance of females given both competitive and noncompetitive instructions; and a significant difference was found between these two groups: women given the former instructions had a faster performance time. When the performance of males given these two instructional forms was considered, no significant difference was found between these groups. Femaleness enhances performance on a color-word interference task no matter what form of instruction might be given; however, the greatest enhancement is found when the instructional form is competitive.

E. SUMMARY

The present research considered the effects of sex and competitive levels on performance of a color-word interference task. It was found that there were differences in performance due to sex, as well as competition. Female *S*s performed significantly faster than male *S*s regardless of the form of instruction. Competitive rather than noncompetitive instructions led to enhanced performances from both sexes. The effects of the competitive instructions led to a greater improved performance from the female *S*s.

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THE EFFECTS OF BODY SIZE AND BODY MARKINGS ON NONPOLARIZED SCHOOLING BEHAVIOR OF ZEBRA FISH (*BRACHYDANIO RERIO*)*

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A. INTRODUCTION

Research on factors associated with schooling has led to the conclusion that vision is the dominant sensory modality (1, 4). Morrow (2) found the primary visual factors to be body size, body shape, body markings, and movement patterns. The few studies that have been executed on the relationship of these factors to schooling are either of limited scope or are inconclusive (6).

Shaw (5) found that if the size of a *Menidia menidia* deviated more than 50% from the average size of fish in a school, it did not school with that group. She also noted that a minimal length of 10 mm-12 mm was needed before schooling commenced. Breder and Halpern (1) found that *Brachydanio rerio* (a facultative schooler) do not school until they reach the age of two months, at which time they are of essentially adult size. Size, though confounded with age, was felt to be the critical factor in both studies.

Contrasting results have been reported for body color as a visual cue in schooling. Breder and Halpern (1) suggested that this factor is significant, since like-colored *Carassius* schooled significantly more than unlike-colored ones. Schlaifer (3) disagreed, finding that body color for mackerel (*Pneumatophorus grex*) has no role as a cue in schooling.

Current information suggests that movement patterns have the greatest significance as a specific visual reference cue (1). However, the relative contributions of body size and body pattern in eliciting schooling have as yet not been adequately investigated. The present study was carried out to test the effect of these variables on three age-size levels of zebra fish.

B. METHOD

1. *Subjects*

Test fish were *Brachydanio rerio* (Zebra fish) of indeterminate sex ranging in length from 1.0 to 4.8 cm. *S*s were ordered into three discrete size groups.

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The mean lengths and standard deviations were as follows: Group 1, 1.4 cm, .27 cm; Group 2, 2.6 cm, .19 cm; Group 3, 4.1 cm, .27 cm. Each of the three groups contained 72 fish for a total *N* of 216. Groups 2 and 3 were maintained together in a 152-liter aquarium (62 cm × 33 cm × 45.5 cm). To prevent the larger fish from attacking the smaller, Group 1 was kept in a 26.2-liter tank (36.5 cm × 21 cm × 25.5 cm). *S*s in Groups 2 and 3 and the parent stock of Group 1 were purchased from a commercial dealer. Overhead florescent lights (12.7 cm above the aquarium) provided illumination and the water in both home aquaria was kept at 22.2° C, had a ph of 6.9, a hardness of 24 ppm, and was aerated. Each of the three size groups was broken down into 36 test groups ($N = 2$) and tested in a two-choice visual preference situation.

2. *Apparatus*

The test tank was a 26.2-liter aquarium (36.5 cm × 21 cm × 25.5 cm) with conditions identical to the home aquaria except for the absence of aeration. A stopwatch, Gralab timer, and six .34 liter wide-mouth jars also were used.

The stimuli used to elicit nonpolarized schooling behavior were black and white photographs taken of zebra fish of three sizes (1.27 cm, 3.0 cm, and 5.0 cm). In the case of intermediate-sized stimuli, the prints were reduced photographically to approximate more closely the mean size of Group 2 test fish, thus producing photographic stimulus test fish of three sizes (1.27 cm, 2.54 cm, and 5.0 cm). Each size was altered further to create three distinct form patterns: natural body markings; reverse stripes, wherein the black and white striations were reversed; and a uniformly gray body shading.

Six matching outline cutouts for each of the nine distinctive fish stimulus patterns were pasted onto identical achromatic background prints (15.24 cm × 20.32 cm) of aquatic plants (*Anacharis*). The test tank was divided into equal parts by a faint red line drawn vertically on the front of the tank. Each *S* was tested individually to determine cumulative time spent in each half of the test tank where stimulus pictures attached to the outside of the tank completely covered each end.

3. *Procedure*

One hour before testing, 25 zebra fish not serving as *S*s were placed in the test tank and removed after 30 minutes. This procedure minimized the effects of increasing chemical residue that could have been produced by the sequential introduction of individual test fish. One-half hour before testing, six *S*s (two each of the three sizes) were placed individually in jars which were floated in the 152-liter aquarium. This allowed the reaction to being caught to dissipate before testing and maintained pretest temperature. After 30 minutes had elapsed *S*s were tested sequentially. Each jar was transferred to the middle of the test tank where it floated for three minutes. This allowed the *S* equal exposure to the stimulus pictures at the ends of the test tank. Transfer into the test tank was done by tipping the jar slowly parallel to the ends of the aquarium (allowing the water in the tank to equalize with that in the jar) to minimize directional bias and excitation. The Gralab timer was then activated for a 10-minute testing interval. Pilot work indicated that 10 minutes of testing could be accomplished before exploration replaces the facultative schooling of the zebra. The number of seconds each *S* spent in the appropriate half of the tank proximate to the picture being tested was recorded. Pilot work pairing a stimulus with no stimulus indicated the behavior observed in this situation to be an approach response rather than avoidance.

The stimulus pairs that each *S* responded to were one of the 36 possible combinations of the nine stimulus pictures. Testing was continued until each of the 36 groups of six test fish had been presented the stimulus comparisons. All order effects were randomly determined.

C. RESULTS AND DISCUSSION

The total number of seconds that the test fish spent in the respective one-half of the tank contiguous to each of the nine individual stimulus pictures was analyzed with the use of 3 by 3 by 3 analysis of variance with eight observations per cell. The factors were test fish size, stimulus fish picture size, stimulus fish body marking, and their second- and third-order interactions.

Significant effects were obtained for stimulus body marking [F (2, 120) $= 11.80$, $p < .005$] and the interaction of test size and stimulus size [F (4, 120) $= 9.76$, $p < .005$]. Student's t was used to make *a posteriori* comparisons among the stimulus body patterns. The natural and reverse striped stimulus patterns differed significantly from the no-stripe pattern [t (120) $=$ 2.16, $p < .025$]; [t (120) $= 1.88$, $p < .05$] but not from each other. Means for the various patterns were as follows: natural stripe 332.50 seconds, reversed stripe 308.61 seconds, and no stripe 252.94 seconds.

The test size × stimulus size interaction given in Figure 1 indicates the importance of body size to schooling behavior, since fish of all test sizes showed an absolute preference for like-sized stimuli. This supports Shaw's

(5) results for *Menidia* and suggests the generality of the size factor across species.

The significant marking effect emphasizes the importance of the body patterning as a visual cue for schooling. In the zebra presence or absence of stripes seems to be a salient variable, but the actual configuration of the striping appears to be relatively unimportant, at least as measured by the reverse stripes used here.

D. SUMMARY

Although prior work indicates that nonpolarized schooling is primarily visual, the specific cues that elicit this behavior have not been identified. To identify potential visual components, three levels each of body patterning and body size of photographic zebra fish stimuli were presented to three age-size groups of test zebra fish in a two-choice situation. The test fish showed an absolute preference for like-sized stimulus fish. Additionally, test *S*s preferred stimuli with stripes (either of natural or transposed shading) to zebra stimuli of an intermediate gray with no stripes.

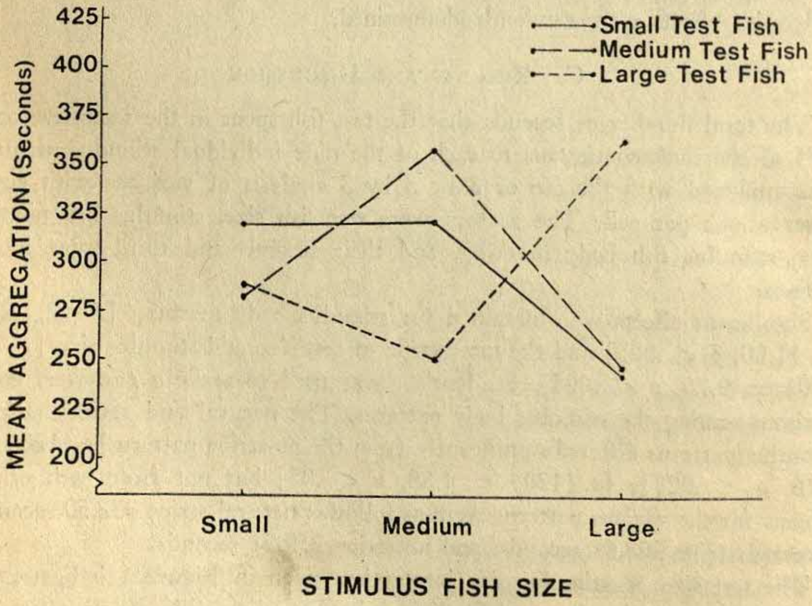

FIGURE 1
NONPOLARIZED SCHOOLING AS A FUNCTION OF TEST FISH AND STIMULUS FISH SIZE

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SOME CORRELATES OF NEGATIVE REACTION TENDENCIES IN INSTITUTIONALIZED RETARDED CHILDREN*[1, 2]

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A. INTRODUCTION

Evidence has been presented that institutionalized retarded children are more wary of approaching and interacting with a strange adult (negative reaction tendencies) than intellectually average children of equivalent mental ages (2, 3). A measure often used to assess negative reaction tendencies has been a Cosatiation index derived from performance on a socially-reinforced marble-dropping game, Marble-in-the-Hole (MITH). On the MITH task the child can persist at each of the two highly similar parts until he is satiated. The Cosatiation index measures the extent to which performance on the first part influences performance on the second part (Time Part I — Time Part II divided by Time Part I + Time Part II). According to the rationale, as a less fearful child plays Part I, he would become relatively satiated on both the game and the social reinforcers dispensed and, therefore, he would tend to play Part II for a much shorter period of time than Part I. The fearful child, on the other hand, could utilize Part I to assure himself that the game does not entail any punishing events. Thus, a wary child would perform on the second part for so long a time that his difference score (Cosatiation index) would be lower than that of an unwary child.

Since it can be assumed that excessive fearfulness would prevent effective adult behavior, it was the purpose of the present study to examine some specific life history correlates of and the developmental course of negative reaction tendencies in a group of institutionalized retarded children. If factors associated with extreme wariness could be identified, it might be possible to

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[2] The authors extend their thanks to the administration and staff of the Brandon Training School, Brandon, Vermont, for their assistance and cooperation in the course of this study, and to Mary Carol Day for serving as the experimenter in this study. The authors are grateful to Christina Orr for her assistance and many insightful comments.

modify such excessive wariness in the retarded. The children were divided into three *MA* level groups in order to assess the relationship between mental development and negative reaction tendencies. Irons and Zigler (1) have previously reported greater wariness in older intellectually-average males than in younger intellectually-average males. This general relationship was expected in the current study. The life history factors examined were the following: preinstitutional social deprivation as measured by the Social Deprivation Scale of Zigler, Butterfield, and Goff (7); the degree to which important persons in the child's preinstitutional life maintained contact with him; and length of institutionalization variables. It was expected that children who came from extremely depriving backgrounds would show greater wariness than children from less depriving backgrounds (6). It was also expected that children who relatively often received visits from and went on vacations with parents and/or other important persons would be less wary than those subjects who did not. This expectation was based on the commonplace observation that children who come into contact with a wide variety of adults tend to be less shy and fearful.

B. METHOD

1. *Subjects*

Thirty-nine children, the entire familial retarded population residing in the Brandon Training School, Brandon, Vermont, at the time of the study, were tested on the experimental task. These children had no gross motor, sensory, or psychotic disorders that would interfere with their performance on the task. Of these 39, 12 were dropped from the sample because their performance did not permit statistical analysis. The remaining children were divided into three *MA* level groups with mean *MA*s of 6.9 (range 5.9-7.7), 8.9 (range 8.0-9.8), and 11.6 (range 10.4-13.0). *IQ* data were obtained from the training school records. The characteristics of these groups are presented in Table 1.

TABLE 1
MEAN *MA*, *CA*, *IQ*, LENGTH OF INSTITUTIONALIZATION (LI), AND NUMBER OF EACH SEX FOR EACH *MA* GROUP

Group	N	*MA* (years) $\overline{X}$	*MA* (years) *SD*	*CA* (years) $\overline{X}$	*CA* (years) *SD*	*IQ* $\overline{X}$	*IQ* *SD*	LI (years) $\overline{X}$	LI (years) *SD*	Sex M	Sex F
MA 6.9	8	6.94	.66	12.69	2.28	58	7.48	3.84	2.00	8	0
MA 8.9	10	8.88	.63	15.86	1.99	57	8.84	3.62	3.16	5	5
MA 11.6	9	11.61	.98	19.25	1.71	68	4.33	3.47	1.82	4	5

2. *Subject Variables*

a. Social deprivation scores. In order to assess the preinstitutional social histories of the retarded *S*s, the Social Deprivation Scale of Zigler *et al.* (7) was employed. This scale, which incorporates 13 indices of social deprivation, has been found to yield four orthogonal factors: (*a*) Continuity of Residence, the number of parent figures experienced by the child; (*b*) Parental Attitude, the attitude of the parents toward institutionalizing the child; (*c*) Familial Richness, the intellectual and economic level of the parents; and (*d*) Familial Harmony, the degree of parental rejection or neglect of the child. In addition to the four factor scores, an overall subjective estimate of preinstitutional social deprivation (Subjective score), similar to that employed by Zigler (4), and an overall Objective score consisting of the four factor scores were obtained. Thus, a total of six social deprivation scores were employed. The scoring was done by a single rater who had no contact with the children. Previous studies employing this scale have obtained consistently high interrater reliability coefficients (6, 7).

b. Maintenance of contact variables. Five measures were collected: number of visits by parents/length of institutionalization; number of visits by parents, foster parents, relatives, and friends/length of institutionalization; number of days vacation with parents/length of institutionalization; number of days vacation with parents, foster parents, relatives, and friends/length of institutionalization; and total number of visits plus days spent on vacation/length of institutionalization.

c. Institutionalization. Length of institutionalization, proportion of life institutionalized, and age at institutionalization were examined.

3. *Procedure*

The experimental task was the MITH game. A grey box .45 m by .45 m by .35 m, with two small holes in the front and a receptacle at the bottom where the marbles were automatically returned following insertion, and 200 marbles, 100 blue, 100 yellow, constituted the apparatus. On Part I the *S*'s task was to drop the blue marbles into one hole and the yellow marbles into the other hole. The child was instructed to tell the *E* when he wished to stop. At that point he was given Part II of the game, which was identical to Part I except that the different color marbles were to be inserted into the opposite holes. On both parts of the game the *E* reinforced the *S* after the first, fifth, and tenth responses, and every tenth response thereafter with one of the four following randomly ordered comments: "That's fine," "Very good," "You really know how to play this game," "You really know how to play Marble-in-the-Hole." Both parts of the game were terminated when the *S* either said he wished to stop or did not insert a marble for 30 seconds. The maximum time allowed on each part was 900 seconds.

A female research assistant in Psychology with experience in testing children tested each child individually. The *E* administered the game in a standardized fashion and reinforced the child in a warm and friendly manner without allowing the child to engage in unrelated conversation. The *E* was unaware of the social deprivation scores of the children.

C. RESULTS

The dependent measure employed, as in previous studies, was the Cosatiation index (Time Part I — Time Part II/Time Part I + Time Part II). A smaller Cosatiation score indicates greater wariness. As mentioned above, the scores of the children who played the maximum time on both parts of the game were excluded, since their performance precluded any analysis based on increases or decreases from Part I to Part II. *t* tests performed between the subjects included in the analyses and *S*s not included failed to reveal any differences on any of the subject variables. It should be noted that persistence for the full 900 seconds on either part of the game results in an indeterminant error of measurement; that is, the Cosatiation score is either overestimated or underestimated. In the *MA* 6.9 group one child persisted for the full time on the first part but not on the second, and one child persisted on the second part but not on the first. Sex of *S* as a dimension could not be included in the overall analyses, as there were no females in the *MA* 6.9 group. A 2(*MA*) × 2(Sex) analysis of variance performed for the two older groups revealed no significant main effect ($F < 1$) or interaction associated with sex of subject and, consequently, this dimension was ignored in subsequent analyses. Preliminary analyses of the Subjective and Objective social deprivation scores, as well as of length of institutionalization, revealed that the three *MA* groups did not differ on these dimensions.

1. *Cosatiation Score Analysis*

A simple *MA* level effects analysis of variance performed on the Cosatiation scores yielded no effect associated with *MA* level ($F < 1$).

2. *Subject Variables*

Correlations between each of the subject variables and the Cosatiation scores are presented in Tables 2, 3, and 4. For the individual *MA* groups

TABLE 2
CORRELATIONS BETWEEN SOCIAL DEPRIVATION SCALE VARIABLES AND COSATIATION SCORES FOR THE TOTAL GROUP AND FOR EACH *MA* GROUP

MA group	*N*	Subjective scores	Objective scores	Factor 1, Continuity	Factor 2, Attitude	Factor 3, Richness	Factor 4, Harmony
MA 6.9	8	.36	.17	.05	—.21	.23	.35
MA 8.9	10	—.36	—.26	—.50	.04	—.35	—.09
MA 11.6	9	.31	.04	.04	.39	—.64*	.28
Total	27	.02	—.12	—.23	—.03	—.18	.06

* $p < .05$.

the results should be interpreted with caution in view of the small sample sizes upon which the correlations were calculated.

a. Preinstitutional social deprivation. For the total group there were no significant correlations between Cosatiation scores and any of the Social Deprivation Scale factors, the Subjective score, or the Objective score. However, for the *MA* 11.6 group there was a significant correlation of Cosatiation scores with Richness factor scores ($r = —.64$, $p < .05$) such that the older children from intellectually and economically deprived homes were more wary.

b. Institutionalization. As can be seen in Table 3 for the total group a significant correlation of Cosatiation scores with age at institutionalization was found ($r = —.34$, $p < .05$) indicating that children institutionalized at an early age were less wary.

c. Maintenance of contact variables. As can be seen in Table 4 a positive correlation of total visits and vacations ($r = .78$, $p < .05$) with the Cosatiation scores was revealed for the youngest *MA* group indicating that, in this group, children who received many visits and who went on many vacations with parents, relatives, and other key figures were less wary than children who did not. In addition, for the youngest group strong correlations were

TABLE 3
CORRELATIONS BETWEEN INSTITUTIONALIZATION VARIABLES AND COSATIATION SCORES FOR THE TOTAL GROUP AND FOR EACH *MA* GROUP

MA group	*N*	Length of institutionalization	Age at institutionalization	Length of institutionalization/*CA*
MA 6.9	8	.34	—.40	.45
MA 8.9	10	.26	—.53	.32
MA 11.6	9	—.30	—.14	—.29
Total	27	.20	—.34*	.30

* $p < .05$.

obtained for total visits ($r = .93$, $p < .001$) and for total vacations ($r = .75$, $p < .05$). These correlations indicate that the *MA* 6.9 children who had many contacts with the preinstitutional environment were less wary. For the oldest group there was a significant negative correlation of total visits and vacations with the Cosatiation index ($r = -.65$, $p < .05$) such that the older children who went on many vacations with and received many visits from key persons from their preinstitutional environments were more wary.

TABLE 4
CORRELATIONS BETWEEN MAINTENANCE OF CONTACT VARIABLES AND COSATIATION SCORES FOR THE TOTAL GROUP AND FOR EACH *MA* GROUP

MA group	*N*	Parents' visits	Total visits	Days vacation with parents	Total days vacation	Total visits and days vacation
MA 6.9	8	.37	.93***	.35	.75*	.78*
MA 8.9	10	.00	—.05	.44	.14	.20
MA 11.6	9	—.26	—.28	—.32	—.54	—.65*
Total	27	.00	.24	.20	.24	.20

* $p < .05$.
*** $p < .001$.

D. DISCUSSION

MA level was not found to be related to wariness. This finding is not in keeping with the findings of Irons and Zigler (1), who found older children to be more wary. This difference in findings may reflect differences in subject populations, inasmuch as Irons and Zigler's sample was composed of children of normal intellect and included both delinquent and lower class subgroups. In addition, the expectation that children who had experienced greater preinstitutional social deprivation would exhibit more wariness was, in general, not confirmed. The fact that in the *MA* 11.6 group those children who came from intellectually and economically impoverished homes exhibited more wariness would appear to provide some limited support for the position that preinstitutional deprivation is a correlate of excessive wariness. However, since this correlation was not consistent across *MA* groups, nor was it consistently found at one *MA* level, it would seem unwarranted to assume that preinstitutional social deprivation is a dramatic component of the excessive wariness often observed in institutionalized retarded children.

A somewhat unexpected finding of the present study was that, for the total sample, those institutionalized at a younger age were found to be less wary. Apparently the institution employed in the present study structured its program for its retarded residents in such a way as to make them less wary of adults over the course of institutionalization, and this programming was especially effective for those children who were institutionalized when very young. It is interesting to speculate that in this particular institution the institutional experience for younger children was arranged in such a way as to make them more amenable to the alteration of negative reaction tendencies through contacts with the outside environment.

The pattern of correlations of maintenance of contact and wariness across *MA* levels is of considerable interest. The children in the youngest *MA* group who received many visits from and went on many vacations with parents or other important preinstitutional figures were found to be less wary than those who did not. In the middle *MA* group the correlations of maintenance of contact with wariness were generally of zero order, while for the oldest *MA* group children who went on more vacations were found to exhibit greater wariness. These findings would appear to suggest that visits and vacations were most important for the younger children, who experienced the more positive aspects of the noninstitutional environment during their contacts, while the older children were more likely to have experienced the more adverse and punishing aspects. In addition, for the older children, trips away from the institution may have been associated with the prospect of locating a job and a place to live, and may have raised the possibility of ultimate separation from the familiar institutional environment.

It is the policy of the institution employed in the current study to encourage a wide variety of contacts with the preinstitutional and noninstitutional environment. The findings of the present study would appear to suggest that such a policy might have positive results in altering some of the rather maladaptive behavior patterns often observed in retarded children, especially if the children are in the younger *MA* ranges. Taken in sum the findings of the present study would appear to support the authors' contention that some of the maladaptive motive states—e.g., wariness—often observed in the retarded are amenable to manipulation (5) and that explicit attention to such motivational manipulations could do much to make the retarded more effective adults.

E. SUMMARY

Thirty-nine institutionalized retarted children divided into three *MA* level groups were administered a satiation-type task used to assess excessive wariness. Wariness was not found to be associated with preinstitutional social deprivation or with *MA* level. Age at institutionalization was found to be

positively related to wariness. Children in the youngest *MA* group who were frequently visited and went on vacations with parents and other important adults were found to be less wary, while children in the oldest *MA* group who received such contacts were found to be more wary.

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A STUDY OF STUDENT VALUES*

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A. INTRODUCTION

A one-semester course, Introduction to College (IC), was instituted at State University of New York at Albany to establish, among other objectives, "certain attitudes," unspecified, toward the college and college life. It has been suggested previously that college experience, as a whole, seems to alter very little the values of students (5). Although one might consider such questions as whether or not student values should be changed, or whether colleges have the right to change them, a more pertinent question would seem to be whether or not college experience *can* change students. Jacob suggests that no one course influences student values. This study is designed to test this contention.

B. METHOD

1. *Subjects*

*S*s were 425 freshman men and women enrolled at the State University of New York at Albany (SUNYA). All were naive as to the purpose of the study. No student over 20 years of age was considered in the final tabulation of the results.

2. *Apparatus*

The Allport-Vernon-Lindzey *Study of Values* (1) was used as the test instrument. The test consists of a number of questions based upon a variety of familiar situations to which two alternative answers (Part I) and four alternatives (Part II) are provided. In all, there are 120 responses, 20 of which refer to each of six values: theoretical, economic, aesthetic, social, political, and religious, as described by Spranger (9).

3. *Procedure*

The study was conducted in two parts: (*a*) a "before-after" procedure was followed to determine the effects of IC in changing student values;

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(*b*) the measuring instrument was administered to a group of freshmen not enrolled in the IC program.

Specifically, the value scale was administered to 250 IC students, approximately half the total IC enrollment, at the beginning of the fall semester. At the end of this semester, 207 students were tested with the same instrument. This procedure afforded us two groups of the same *S*s for study: i.e., pre-IC and post-IC.

Each *S* recorded his preference numerically for each alternative-answer statement. Scores were then added together, yielding a summed score for each of six values. Since the sum of the six final scores for every subject must be the same, equal scores were given to alternative answers under questions that had been omitted. However, if there were more than two omissions in either Part I or Part II, that paper was discarded. On this basis and because of withdrawals from college, the subject population was reduced to 207 (128 female, 79 male).

An additional 175 *S*s, none of whom was enrolled in the IC program, were tested at the end of their first full semester. This afforded us two groups of different *S*s for study: i.e., post-IC and non-IC. The purpose of this group was to control the effects of the first semester of college experience on values. The procedure followed was identical to that stated above. Since 12 papers were discarded for reasons of omissions, the subject population was reduced to 163 (126 female, 37 male).

C. Results

With respect to the mean value scores for 207 pre-IC students and 1816 liberal arts students (1951 norms), the social category reflected the only nonsignificant difference. SUNYA *S*s scored higher on theoretical, political, and religious categories ($p \leqslant .01$), and lower on economic and aesthetic categories ($p \leqslant .0001$). The largest difference was found in the aesthetic category (Table 1).

Means and t values for pre-IC, post-IC and non-IC groups are summarized in Table 1. A significant increase was revealed for theoretical, aesthetic, and religious values, as well as a nonsignificant increase in the political category. There appeared to be a decreasing interest in economic and social categories; neither of these differences, however, was significant. Since three of six t's significant at the .05 level would occur only less than once in 2000 by chance (12), it was concluded that IC and/or college experience shifted student interests.

Post-IC *S*s scored higher in economic, social, and religious categories and

TABLE 1

MEANS AND *t* VALUES[a] FOR PRE-, POST-, AND NON-IC STUDENTS FOR SIX VALUE CATEGORIES

Category	Group											
	IC *vs.* Norms $n = 239$ *vs.* 1816			*t*	Pre-IC *vs.* Post IC $n = 207$			*t*	Post IC *vs.* Non-IC $n = 207$ *vs.* 163			*t*
Theoretical	41.55	*vs.*	39.60	3.64**	41.35	*vs.*	42.23	—2.41*	42.23	*vs.*	41.58	—1.11
Economic	38.12		40.34	4.63**	37.92		37.54	0.81	37.54		32.21	2.43*
Aesthetic	35.76		39.86	7.29**	35.80		38.46	—6.52**	38.46		40.27	—5.25**
Social	39.88		39.59	0.63	40.19		40.13	0.17	40.13		38.15	5.80**
Political	41.56		40.27	2.55**	41.40		41.65	—0.68	41.65		41.15	—1.63
Religious	43.12		40.32	4.62**	43.35		44.51	—2.59**	44.51		42.48	3.19**

* $p \leq .02$.

** $p \leq .01$.

[a] Minus signs indicate direction of change from Pre- to Post-IC and direction of difference from Post-IC to Non-IC.

lower in political, aesthetic, and theoretical categories. Only the economic, aesthetic, social, and religious categories revealed a significant difference ($p \leqslant .02$). Thus, the non-IC *S*s scored significantly higher only in the aesthetic category, reflecting, somewhat, characteristics more similar to the normative group than those of the pre-IC *S*s. Four of six *t*'s significant at the .05 level would occur only less than once in 10,000 by chance alone.

D. Discussion

The original findings that men score higher than women on the Allport-Vernon-Lindzey theoretical, economic, and political values but lower on the aesthetic, religious, and social (11), amply verified (3, 4, 6, 8, 10), was supported by the measures taken on the pre-IC group.

Probably because of their availability, different academic groups have often been analyzed with respect to their values. Though many statistical differences are reported between the values of various academic groups and although these differences are practically always in the expected direction, the order of the differences for any single value is so low and the possible variation in other values so great that predictions of major academic pursuit from value scores would not be very efficient. For these reasons, this study did not attempt to evaluate academic pursuit in terms of value scores. However, support for the observed relationship between the social value and achievement in college (6) may be found in the significantly higher social values of those who successfully complete college, as compared to those of withdrawals (2, 7).

Table 2 summarizes the shift in value scores for the 1951 norm group and all three study groups. The direction of shift seems to indicate that IC classes possessed an atmosphere that tended to emphasize religious questions and were oriented around extracurricular materials. Specific examination of Table 2 demonstrates that, in general, pre-IC students differ significantly from the normative students with the largest difference occurring with respect to the low aesthetic score of the pre-IC students. In this same category, post-IC students had higher scores than pre-IC, and non-IC students revealed even higher scores. It would appear that a semester of college experience produced SUNYA students who resemble the normative group more than they do pre-IC: i.e., it increased interest in aesthetic values.

It is interesting to note, too, that SUNYA students had higher scores than the normative group in theoretical, political, and religious categories. However, since non-IC students had higher scores than post-IC in the theoretical and political categories, and lower scores in the religious category, it seems

TABLE 2
SHIFT IN VALUE SCORES FOR ALL GROUPS[a]

Category	Group		
	Pre-IC *vs.* Norms	Pre-IC *vs.* Post-IC	Post-IC *vs.* Non-IC
Theoretical	Pre-IC	Post-IC	Non-IC (ns)
Economic	Norms	Pre-IC (ns)	Post-IC
Aesthetic	Norms	Post-IC	Non-IC
Social	Pre-IC (ns)	Pre-IC (ns)	Post-IC
Political	Pre-IC	Post-IC (ns)	Non-IC (ns)
Religious	Pre-IC	Post-IC	Post-IC

[a] The group in each cell represents the higher value score.

logical to conclude that college experience is responsible for the former and the course, IC, is responsible for the latter.

Contrary to Jacob's conclusion, college experience does tend to shift the values of college students and a course of a specific nature can produce a change in a specific value category. It is suggested that this shift occurs because of a decreasing concern with "private" values and an increasing concern with social-group, political, and religious-moral values.

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REACTION TIME AS A FUNCTION OF MAGNITUDE ESTIMATIONS OF VIBROTACTILE INTERNAL NOISE*[1]

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A. INTRODUCTION

The empirical probabilities of *S*'s reporting a signal on noise (N) trials and on signal-plus-noise (SN) trials comprise the most frequently employed measures of *S*'s decision making behavior in a signal-detection task. A second dimension of *S*'s behavior in the detection task, and one which has received relatively little experimental attention, is *decision time*. Using vibrotactile signals Gescheider, Wright, and Evans (2) and Gescheider, Wright, Weber, Kirchner, and Milligan (4) examined the relationship between reaction time (RT) and signal probability and proposed that the RTs for signal-present and signal-absent decisions could be accounted for in terms of the Theory of Signal Detection (TSD) if it is assumed that RT becomes progressively longer the closer on the sensory continuum a sensory observation is to *S*'s signal-present—signal-absent decision criterion. This assumption is consistent with the fact that disjunctive RT in a discrimination task increases as the psychological distance between stimuli decreases (1, 5). In the detection situation *S* is also confronted with a discrimination task, since he must decide whether an observation has originated from a point on the sensory continuum above his criterion and hence report "signal present" or from a point on the sensory continuum below his criterion and hence report "signal absent." Consequently, the closer an observation is to the decision criterion, the more difficult it should be and the longer it should take for *S* to make his decision.

In the studies by Gescheider *et al.* (2, 4) an indirect test of this hypothesis was made by examining RT for signal-present and signal-absent decisions as a function of the location of *S*'s criterion, which was estimated from the detection-probability data. Consistent with the above hypothesis, mean RT for the signal-present decisions decreased as a function of signal probability, while mean RT for the signal-absent decisions increased as a function of

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signal probability. The present experiment consisted of a more direct test of the hypothesis that decision time is shorter for sensory observations substantially above or below criterion than for observations close to criterion. The method of magnitude estimation was used to determine the magnitude of the sensory event experienced in both the N and SN trials, regardless of whether *S* reported "signal present" or "signal absent" for those trials. A sufficient number of observations was made for the no-signal (i.e., N) trials to establish the relationship between RT for *S*'s signal-present—signal-absent decisions and the sensory magnitude of the events occurring in the no-signal trials. For observations below criterion (i.e., the signal-absent decisions) the RTs were predicted to decrease as the estimated sensory magnitude of those observations decreased because of the increasing distance of those observations from the criterion. At the same time, the RTs for observations above criterion (i.e., the signal-present decisions) were expected to decrease as the estimated sensory magnitude of those observations increased because of the increasing distance of those observations from the criterion.

B. METHOD

1. *Subjects*

The *S*s were four undergraduate students at Hamilton College.

2. *Apparatus*

The signals were 60-Hz sinusoidal vibrations applied for 500 msec to *S*'s left index fingertip by a Goodmans V-47 vibrator. Signal intensity was regulated in 1-dB steps by a decade attenuator box. The *S* sat with his left index fingertip resting on a vibrator contactor ¼ inch in diameter and his right hand touching a bidirectional telephone switch which could be closed to the left or right from its open position. A one-second white light served as a ready signal and was followed one to two seconds later by a one-second observation interval which coincided with the one-second presentation of a green light. The *S*'s task was to judge the presence or absence of the tactile stimulus as quickly as possible following the onset of the green light. He made his judgment by closing the telephone switch to the right to indicate "signal present" or to the left to indicate "signal absent." The closing of the switch in either direction stopped a timer (Hunter 120A Klockcounter) activated automatically at the onset of the observation interval. Reaction times were recorded to the nearest msec. Knowledge of results was given to *S* after each judgment.

3. *Procedure*

During a session signals with amplitudes ranging from —6 to 14 dB relative to *S*'s absolute threshold were presented in random order. Each *S* made a total of 72 judgments for each of the 21 signal amplitudes when p(S) was .70 and also when p (S) was .30. The number of judgments on N trials was 3528 for the p(S) of .30 and 648 for the p(S) of .70. The two values of signal probability were counterbalanced over 36 sessions, and *S* was told the value of p(S) at the beginning of each session. The signal and no-signal trials occurred in random order for each *S* in each session. The *S* was required to make on every trial a judgment consisting of a signal-present—signal-absent decision and a direct estimate of the magnitude of the sensory event that occurred during the observation interval. It was assumed that sensation magnitude judgments for observation intervals containing a stimulus would reflect momentary magnitudes of signal plus noise (SN), whereas such judgments for observation intervals not containing a stimulus were assumed to reflect momentary magnitudes of neural noise (N). Prior to the beginning of the experiment *S*s were given several one-hour practice sessions at a p(S) of .50 with the use of the above procedure.

C. Results and Discussion

The relationship between RT and sensation magnitude for the trials on which no signal was presented (i.e., the N trials) was established by grouping *S*'s estimations of the magnitude of the sensory event experienced during the no-signal trials into 20 intervals of five-unit width over a range from one to 100 units of sensation magnitude. Mean RT was then computed for the judgments falling in each interval. The results of this analysis are plotted in Figure 1 for each of the four *Ss*. The filled points represent the mean RTs for the correct signal-absent decisions and the open points represent the mean RTs for the incorrect signal-present decisions. The *Ss* made so few incorrect signal-present decisions on the no-signal trials under the p(S) .30 condition that the mean RTs for the incorrect signal-present decisions under p(S) .30 were not considered reliable, and hence are not plotted in the upper half of Figure 1. The magnitude estimation and RT data for the trials on which a signal was presented (i.e., the SN trials) were considered in another paper (3) within the context of an entirely different problem—viz., the operation of vibrotactile absolute thresholds—and for this reason are not considered here.

The results presented in Figure 1 strongly support the notion that *S* can perceive accurately moment-to-moment fluctuations in the magnitude of internal noise. This conclusion is supported by the fact that *S* was able to assign

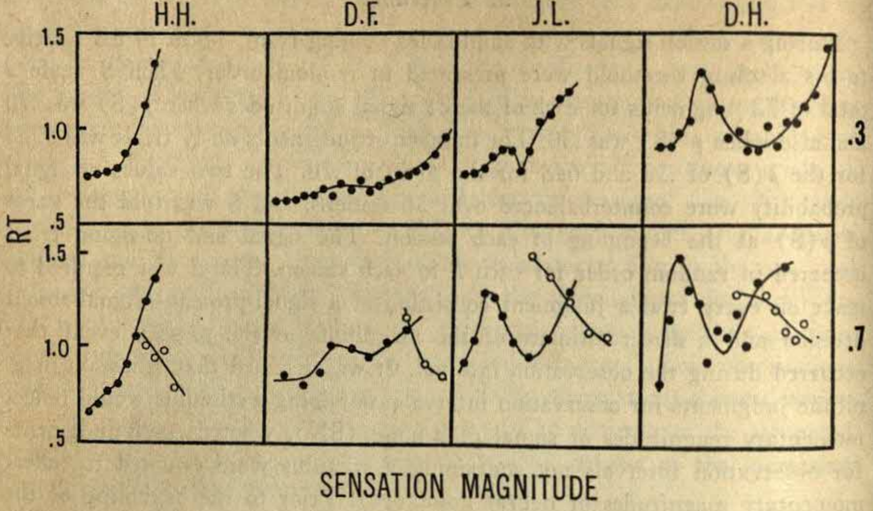

FIGURE 1
REACTION TIME IN SECONDS FOR THE CORRECT SIGNAL-ABSENT DECISIONS (FILLED POINTS) AND THE INCORRECT SIGNAL-PRESENT DECISIONS (OPEN POINTS) AS A FUNCTION OF THE ESTIMATED SENSORY MAGNITUDE OF NEURAL NOISE

different numbers to represent the changes in the sensory magnitude of neural noise occurring over a series of no-signal trials. Taken alone, however, the magnitude estimations do not conclusively support the hypothesis that *S* can discriminate variations in the magnitude of internal neural noise. But it can clearly be seen in Figure 1 that the RTs accompanying the estimated sensory magnitudes increased for the correct signal-absent decisions, but at the same time showed a decrease for the incorrect signal-present decisions. Since all sensory events producing signal-absent decisions presumably fall below the point on the sensory continuum where *S* has located his signal-present—signal-absent decision criterion, the increase in RT as a function of the reported sensation magnitudes accompanying the correct signal-absent decisions can only mean that the larger noise magnitudes, with their correspondingly longer RTs, are nearer *S*'s criterion than are the smaller noise magnitudes, with their correspondingly shorter RTs. Similarly, since all sensory events producing signal-present decisions presumably fall above the point on the sensory continuum where *S* has located his decision criterion, the decrease in RT as a function of the reported sensation magnitudes accompanying the incorrect signal-present decisions can only mean that the larger noise magnitudes, with their correspondingly shorter RTs, are further from *S*'s criterion than are the smaller noise magnitudes, with their correspondingly longer RTs.

The increase followed by a decrease in RT for signal-absent decisions as sensory magnitude increases from the lowest to moderate values cannot be explained in terms of the decision process described above. Perhaps for sensory observations of very low magnitude, another decision process based on an absolute threshold rather than on an adjustable criterion is operating. It is conceivable that for sensation magnitudes slightly above absolute threshold *S*'s RT for reporting the absence of a signal increases because the observation is barely discriminable from those below threshold. Data from D. F., J. L., and D. H. suggest that observations of slightly greater sensation magnitude result in short RTs because they are clearly above threshold but also clearly below criterion. The SN data of the present experiment (3) strongly suggest the operation of absolute thresholds for vibrotactile stimulation. However, further experimentation is needed to determine conclusively whether RT is related to the proximity of sensory observations to such thresholds.

D. SUMMARY

Vibrotactile signals were presented to *S*'s index fingertip during a specified observation interval at a signal probability of either .30 or .70. The *S*'s task was to report the presence or absence of the signal as quickly as possible and to estimate the magnitude of the sensory event experienced during the observation interval. The relationship between reaction time and estimated sensory magnitude was established for each of four *S*s. Reaction time was found to vary systematically with estimated sensory magnitude. This finding was interpreted as support for the hypothesis that *S*'s decision time is longer, the closer on the sensory continuum a particular observation is to his decision criterion.

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TEMPERAMENT CHARACTERISTICS OF CHRONIC ALCOHOLICS AS MEASURED BY THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY*[1, 2]

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A. INTRODUCTION

The Guilford-Zimmerman Temperament Survey (GZTS) measures 10 relatively independent "temperament" traits defined through a factor analytic approach. Each of the 10 clinical scales is bipolar in its composition with moderately high scores being considered good indicators of adaptive temperament traits and very low or very high scores indicative of maladaptive personality traits. The inventory was constructed to replace the much used Guilford series of personality inventories. Although Buros (1) cites 173 references to the GZTS, with the exception of Harney's (4) study of the GZTS on a general psychiatric population, a thorough search of the available literature reveals that the inventory has not been used on a clinical population. The present study was designed to determine baseline statistical data on the temperament characteristics of a hospitalized group of chronic alcoholic patients as measured by the GZTS in comparison to the normative population on which it had been previously standardized. The reliability of the 10 temperament scales and the three validity scales developed by Jacobs and Schlaff (5) also will be investigated.

B. METHODOLOGY

The *S*s were 100 voluntarily hospitalized alcoholic veterans of the armed services who were found to fit Jellinek's (6) criteria for Stage 3 and Stage 4

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problem drinkers and who also were independently diagnosed by two psychiatrists as being alcoholic. As far as could be determined the *S*s were free from organic brain syndrome residuals, as well as decompensating medical illnesses at the time of testing. All *S*s lived within a 50-mile radius of Chicago.

*S*s ranged in age from 28 to 54 with a mean of 39.65 years and a standard deviation of 6.0 years. Occupational levels varied from unskilled manual to professional and managerial. Educational levels varied from primary school to graduate degrees with the mean being 12.02 years education and a standard deviation of 2.6 years.

Instructions to the subjects on the test booklet were modified in keeping with Harney's (4) suggestions. Since the GZTS includes a "?" category, the subjects were instructed to do the following: "*Special note:* If your first choice to a question is in the "?" (i.e., doubtful) category, please *add* your second choice to the "yes" or "no" category. Thus any "?" mark will require a *second* choice on your answer sheet. For statistical reasons, a certain number of "?" answers tends to render a record invalid or unscorable."

Although our sample of alcoholic veterans has a higher mean age than the Guilford and Zimmerman college sample (23 years) to which we are comparing them, there are two factors that tend to make such a comparison legitimate. First, Guilford and Zimmerman (3) report "many veterans" in their sample; second, when the GZTS was administered to a group of high school seniors and their parents whose ages ranged from 37 to 62, no significant differences were found in mean scores between parents and offspring.

C. Results and Discussion

Table 1 compares alcoholic inpatients with male college student norms developed by Guilford and Zimmerman (3). An examination of the table indicates that the inpatient alcoholics scored below the college male normative sample on three of the 10 clinical scales two of which are significantly below the .05 level of probability: Emotional Stability (E) and Objectivity (O).

On the E scale the alcoholics tended to represent themselves as being slightly more vulnerable to feelings with greater shifts in mood and more of a basic sense of emotional volatility than the college males.

On the O scale, alcoholics tended to display a somewhat greater lack of adequate defenses to cope and maintain comfort with their feelings when contrasted with college males. This would tend to follow from the general literature on alcoholism which indicates that alcoholics are indeed emotionally vulnerable and emotionally volatile.

TABLE 1
COMPARISON OF ALCOHOLIC INPATIENTS AND COLLEGE MEN ON GZTS CLINICAL SCALES

Scale	Alcoholic ($N = 100$) Mean	Alcoholic ($N = 100$) *SD*	College ($N = 523$)[a] Mean	College ($N = 523$)[a] *SD*	Difference between means
General Activity (G)	17.5	5.57	17.0	5.64	.5
Restraint (R)	16.0	4.38	16.9	4.94	— .9*
Ascendance (A)	16.4	5.62	15.9	5.84	.5
Sociability (S)	17.5	7.04	18.2	6.97	— .7
Emotional Stability (E)	14.8	6.68	16.9	6.15	—2.1**
Objectivity (O)	16.0	5.78	17.9	4.98	—1.9***
Friendliness (F)	13.0	5.18	13.8	5.07	— .8
Thoughtfulness (T)	17.8	4.60	18.4	5.11	— .6
Personal Relations (P)	16.7	6.13	16.7	5.05	
Masculinity (M)	19.5	4.12	19.9	3.97	— .4

* $p < .10$.
** $p < .01$.
*** $p < .001$.
[a] For all scales except scale T for which $N = 116$.

Table 2 shows the intercorrelations of the 10 clinical and three validity scales with each other. For the most part, the intercorrelations are low. This would tend to indicate that the traits are indeed unique as Guilford and Zimmerman (3) have suggested. However, as found by Guilford and Zimmerman there are two intercorrelations among the clinical scales that are suspiciously high: that between S and A and that between E and O.

In Linden's (7) factor analytic study of the GZTS it is interesting to note that the S and A scales were found to be a major part of one factor, that of Social Drive which relates to the external social behavior of people. The O and E scales were found to be major components of the other factor

TABLE 2
INTERCORRELATIONS OF TOTAL SCORES BETWEEN GZTS TRAITS FOR ALCOHOLIC SAMPLE

Trait	G	R	A	S	E	O	F	T	P	M	GF	SF	CD
G		—.12	.46	.45	.28	.18	—.06	—.02	.16	.04	.286	.67	—.28
R			.08	.05	.14	.08	.20	.42	.23	.03	.23	.216	—.157
A				.72	.40	.26	—.30	.36	.10	—.02	.347	.580	—.492
S					.52	.42	.02	.24	.32	—.11	.432	.699	—.544
E						.66	.23	.18	.40	.21	.65	.532	—.636
O							.46	—.07	.54	.37	.599	.490	—.648
F								.30	.59	.14	.394	.161	—.177
T									—.07	—.12	—.05	.256	—.167
P										.13	.487	.414	—.413
M											.24	.128	—.190
GF												.484	—.521
SF													—.591
CD													

found by Linden which was labeled Emotionality and which relates to inward feelings. Linden points out that these two scales are considered to be the cornerstone of the GZTS, since they are most closely related to how an individual feels "in the quality of his efforts to strive toward comfort with feeling."

It is also interesting to note that no significant differences are found between alcoholics and college males in regard to those traits that comprise Linden's Social Drive factor. That is to say, in taking the GZTS, the alcoholic purports temperament traits similar to a normal population, at least as far as his external behavior is concerned. However, with regard to his internal-feeling-emotional life, and how he handles such inner life, the alcoholic displays greater emotional volatility and vulnerability. The alcoholic's tendency to see himself like normal people see themselves, at least as far as external behavior is concerned, is supported by the findings of Mozdzierz, Macchitelli, deVito, and Flaherty (8), which indicate that alcoholics in responding to how they see themselves on a personality characteristic checklist tend to project an image that is highly correlated with the way normals see themselves, whereas no relationship was found between the way in which they see themselves and the way in which they see other alcoholics.

Table 3 indicates the estimates of reliability for each of the 10 clinical scales on the two populations. It will be noted that the first half-second half reliability coefficients for the alcoholic population are not particularly gratifying, but such measures of reliability are always considered underestimates. The estimates of the coefficients of equivalence are considerably higher, as could be expected. It is interesting that traits A and S which are highly cor-

TABLE 3
RELIABILITY COEFFICIENTS OF THE GZTS CLINICAL SCALES

Trait	Alcoholic sample 1st half—2nd half	Coefficients of equivalence[a]	Guilford-Zimmerman normative sample
G	.65	.79	.79
R	.55	.70	.80
A	.76	.84	.82
S	.84	.96	.87
E	.80	.89	.84
O	.63	.77	.75
F	.68	.80	.75
T	.59	.74	.80
P	.74	.85	.80
M	.54	.72	.85

[a] Guilford's estimates of reliability are based on the Kuder-Richardson formulas, whereas our estimates of reliability are based on the coefficient of equivalence suggested by Cronbach (2, p. 141).

related have two of the highest reliability coefficients among the 10 clinical scales. The estimates of reliability obtained on the alcoholic population are equal to or higher than those of Guilford and Zimmerman on seven of the 10 clinical scales.

Our alcoholic sample and the Guilford and Zimmerman college sample did not differ in their scores on the Gross Falsification Scale (GF) or the Subtle Falsification Scale (SF) constructed by Jacobs and Schlaff (5). The GF scale is composed of items usually not answered in the keyed direction but which are easily fakeable under instructions. The SF scale is composed of fakeable items which were answered in the score-keyed direction at least half of the time. This scale was designed to identify those subjects who tended to give themselves the benefit of the doubt on items often answered in an unfavorable direction. However, the two populations did differ markedly in their scores on the Carelessness-Deviancy Scale (CD) which is composed of items very rarely answered in an unkeyed direction (Critical Ratio $= 5.03$, $p < .001$). Both the mean and standard deviation of the alcoholic sample on CD are more than twice as large as the college sample norm. Jacobs and Schlaff do not elaborate very much on the CD scale, but they do indicate that extremely unpopular responses are keyed in the CD scale. It is unclear whether alcoholics were indeed careless in taking the GZTS, as the name of this scale indicates, or whether they were simply identifying unpopular temperament traits as indeed belonging to themselves. As stated earlier, since the data found by Mozdzierz *et al.* (8) indicate that alcoholics see themselves like normal people on a personality characteristic checklist, it is unlikely that they would attribute extremely unpopular responses as being applicable to them. It is much more likely that a certain percentage of alcoholics were somewhat careless in answering the items on the CD scale.

It would be interesting to determine the relationship between the clinical and validity scales of the GZTS and other more widely used objective personality measures, such as the MMPI.

D. SUMMARY

The GZTS was administered to 100 hospitalized alcoholic veterans with their scores on the clinical and validity scales compared to Guilford and Zimmerman's normative sample. Few differences were found between the two groups except for the following: the Emotional Stability (E) scale in which alcoholics were identified as being more vulnerable to feelings with greater shifts in mood or more of a basic sense of emotional volatility than college males; and the Objectivity (O) scale in which alcoholics tended to

display a somewhat greater lack of adequate defenses to cope and maintain comfort with their feelings when contrasted with college males. Alcoholics were also markedly more careless in their test taking than college males. Reliability coefficients are presented and discussed, as well as suggestions for future studies with the GZTS.

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ZEN AND THE PSYCHOLOGY OF EDUCATION*

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The experience of self-identity is often accepted as a self-evident proposition of educational psychology. This assumption needs to be reexamined because the respected supposition of "self" is the basis for conceptual difficulties in psychology. Often a conceptual scheme may be constructed in a logical effort to escape the assumptions with which it began. This is what has occurred in psychology insofar as it uses a concept of self. With the emergence of Zen wisdom into Western thought, however, another way of investigating the experience of self is available for psychology. Because Zen does not seek to construct a logical scheme that is supposed to define a presupposed self-identity, it avoids the problems of this concept. Perhaps, therefore, Zen insight can give a feeling for what it is to learn by a new way, a way different than we ourselves were taught.

The vital point of a learning situation is the experience of self in the learner. The attitude of the student towards himself creates the educational situation, and how this is used is the essence of teaching. In the West, speaking generally, the emphasis on the learner's domination of what he confronts is the basis for education. With this view, the student, or rather his self-image, is prepared to learn according to the notion that he will make the subject matter his own. This means that the self, the conscious mind, is a level of abstraction above what is learned; the self is the dominating force that memorizes, manipulates, and expresses what is learned. How else could it be? Well, in Zen the idea of self is considered somewhat ridiculous, at least when confronted with the situation of Zen enlightenment or *satori.* That is, learning about things is successful to a point, but when the individual seeks learning of himself, all he finds he can discover is a socially formed idea of identity. The person finds he can be aware of himself only through the same means he assimilates the rest of the world, while at the same time feels that his identity really cannot be grasped because this awareness is exercised by a socially created self-image. Therefore, when the self attempts to conceive of

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itself, it is confronted with a situation where the method no longer is equal to the task; as a snake trying to swallow its tail, it only fails.

While Zen is concerned with the experience of the self by itself in order to demonstrate how impossible it is to experience one's identity in the usual manner, Western psychology often accepts the self as a primary fact of experience and, consequently, tries to show how this entity interacts with itself and its world. Although psychologists have come close to recognizing the experience of Zen enlightenment, most often they do not explore what the effects of this type of experience would be for the individual's self-conceptualization. Freud, even though he sought a unified picture of the healthy individual, saw a fundamental dualism in self-experience, as exemplified in his concept of the struggle of the life and death instincts in man. Even in the modern revival of Freud by Norman O. Brown, the Eros-Thanatos dualism is still alive, although Brown hopes that Thanotos may someday be "the friend" of Eros (2, p. 322).

Perhaps a clear expression of a modern psychologist's struggle with the tension between the dualistic and the unified views of self-experience can be seen in the work of Rollo May:

> What does it mean to experience one's self as a self? The experience of our identity is the basic conviction that we all start with as psychological beings. It can never be proven in a logical sense, for consciousness of one's self is the presupposition of any discussion about it. There will always be an element of mystery in one's awareness of one's own being—mystery here meaning a problem the data of which encroach on the problem. For such awareness is a presupposition of inquiry into one's self. That is to say, even to meditate on one's own identity as a self means that one is already engaging in self-consciousness (5, p. 79).

Here May sees the problem of the inability of the individual to gather data about his experience of himself, but chooses to pass over it as a "basic conviction" or a "mystery" of awareness. Although May recognizes this as a problem for psychology, since he acknowledges that the methods of investigation of psychology are of the same level as the very processes investigated, he still feels little difficulty in discussing the self as an "entity acting in the world of objects" (6, p. 17).

The results of this presupposition lead May to explore a dualistic conception of self rather than the problem of the mysterious conviction of self. Indeed, the "human dilemma" is "Man's capacity to experience himself as both subject and object at the same time" (6, p. 8), rather than his capacity for accepting the presupposition upon which this dilemma rests. Therefore, although May says that in moments of deep understanding it is "as though" the individual and his experience merge, he asserts that "certainly there must be an 'understander' if there is to be understanding" (6, p. 155). To understand the self that feels the object-subject dilemma then becomes the basis for May's investigation of "man's significance for himself" (6, p. 25) as a creator of values "essential to his existence as a self" (6, p. 72). Finally, therefore, May ends up with much of Western psychological tradition by asserting the concept of self, regardless of the inability of psychology to explore this assumption.

Clearly, just that inability of the person to capture his experience of himself in terms of his self-conception is what psychology must often ignore in order to say anything at all. Very much afraid that the snake may succeed in swallowing its tail, psychology advises not taking hold of the tail to begin with. The problems to which this admonition leads are the same problems that much of psychology tries to correct; the assumptions create both the difficulties and the solutions. This vicious circle is recognized by those, such as Alan Watts, who directly confront the problem. Watts sees that any logical system, including one about man's self-conceptualizing, "must contain a premise which it cannot define without contradicting itself" (11, p. 74). That is, the individual is not aware of himself, cannot be conscious of himself as the absolute fact of experience simply because the assumption of the self cannot be established without resorting to some higher level of order. If this contradiction is not broken, then the problem of individual consciousness will remain insoluble:

> Modern man, in so far as he is still Cartesian, is a subject for whom his own self-awareness as a thinking, observing, measuring and calculating "self" is absolutely primary. It is for him the one indubitable "reality," and all truth starts here. The more he is able to develop his consciousness as a subject over against objects, the more he can understand things in their relations to him and one another, the more he can manipulate these objects for his own interests, but also, at the same time, the more he tends to isolate himself in his own subjective prison, to become a detached observer cut off from everything else in a kind of impenetrable, alienated, and transparent bubble which contains all reality in the form of purely subjective experience. Modern consciousness then tends to create this solipsistic bubble of awareness—and ego—self imprisoned in its own consciousness, isolated and out of touch with other selves in so far as they are all "things" rather than persons (7, p. 22).

What, then, does Zen have to say to this problem of self-experience? In the Zen experience the focus upon the self by its own processes of understanding leads to the solution, or rather the dissolution, of the problem. With

Zen the snake is encouraged to swallow its tail and see what happens; the dualism of self as object of its own experience crumbles of its own accord:

> No ego, and again no personality,
> There is neither subject nor object (10, p. 114).

When this is realized in *satori,* the flash of insight that dissolves the split of the individual and his world or the individual and himself, the individual is freed from the subjective urge to objectify himself in his experience:

> There is no particularly determined entity in us which is psychologically designated as mind or thought. The moment we think we have taken hold of a thought, it is no more with us. So with the idea of a soul, or an ego, or a being, or a person, there is no such particular entity objectively to be so distinguished, and which remains as such eternally separated from the subject who thinks. This ungraspability of a mind or thought, which is tantamount to saying that there is no soul-substance as a solitary, unrelated "thing" in the recesses of consciousness, is one of the basic doctrines of Buddhism (9, p. 49).

This realization or, for the purposes of this paper, the intellectual recognition of this doctrine, heralds the collapse of all the tricks of the idea of self-sufficient ego because the ego cannot capture itself in its own conceptualizations. As always suspected, the snake cannot swallow his tail, at least in the usual way. If the self cannot capture itself, what then is the result of enlightenment? One of the Sutras says of the self's attainment: "in emptiness there is no form, no sensation, no thought, no perfection, no consciousness; no eye, ear, nose, tongue, body, mind; there is no knowledge, no suffering, no accumulation because there is no attainment" (9, p. 27). That is, for the self to attain *satori* is no attainment at all, since it dissolves, not into nothing, but into an unconditional, transcendent reality.

Perhaps content, as well as the doctrine, can be grasped in this pair of poems by a Zen master. In the first, the language of the Zen conceptualization of the self is stated as a poetic image, rather than an absolute idea:

> The body is the Bodhi Tree;
> The mind like a bright mirror standing.
> Take care to wipe it all the time,
> And allow no dust to cling.

In the second, however, this image is denied, and the poetic reversal, rather than being contradictory, reflects the necessary paradox of human enlightenment:

> There never was a Bodhi Tree,
> Nor bright mirror standing.

> Fundamentally, not one thing exists,
> So where is the dust to cling? (11, p. 92)

Just as psychological investigation into the nature of the self becomes a paradox, the Zen man finds that his mind expresses this dilemma every time he thinks. Unlike psychology, however, the enlightened person does not hold the dualism as fundamentally true but as an artistic dialectic which is synthesized in *satori.* Therefore, the Zen experience is not an experience of self in objective terms nor of the world in subjective terms, but is, like a mirror that reflects its own image, an experience that has no way of grasping itself.

Once the individual recognizes himself in this fashion, he is able to see himself and his world, or any other supposed dualism, as a mere representation. The Zen man's actions in the world become simple, as easy as the experience itself; before Zen the mountains and rivers were just mountains and rivers, with Zen they no longer were mountains and rivers, but after Zen they were again mountains and rivers. The enlightened person is able to reflect reality with a clear mind but does not take his thoughts as the full extent of that reality:

> If we take second thought for an effective reality, we keep going on and on around the wheel of birth and death. You should realize that such thought is just temporary mental construction, and not try to hold or to reject it. Let it alone just as it occurs and just as it ceases. It is like an image reflected in a mirror. The mirror is clear and reflects anything which comes before it, and yet no image sticks in the mind (11, p. 142).

So it is that the Zen man returns, gaining nothing but what was always there, but now he does not need to cling to it or his enlightenment, since "to be conscious of the original mind, the original nature . . . is the great disease of Zen" (11, p. 152). There is no great importance in the Wise man or his teachings, he just lets them live:

> My words are easy just to understand:
> To live by them is very easy too;
> Yet it appears that none in all the world
> Can understand or make them come to life (1, p. 123).

Zen does not deny life, or the self, but merely says that where you see life, there is death too, or where self is, there is also no-self. All concepts, like all things, yield their opposites. With this the individual returns to the world but with the results of his enlightenment clearly in mind:

> Not only is it admitted that there are spheres of life in which assertion, judgements, plans, and purposeful actions play a part, but Zen even goes

> so far as to acknowledge that these modes of behavior are necessary to existence, thus justifying the destruction of the primal unity—the split into subject and object—but only to the point where it threatens danger and disaster (3, p. 55).

Therefore, the goal of Zen is not to experience enlightenment constantly, but act in accord with it, even as the self and the world become conceptualized. As D. T. Suzuki says of the goal of Zen monastic training; "the (monastic) life is considered finished not only when the truth (of enlightenment) is intuitively grasped, but when the truth is demonstrated in every phase of practical life with its multitudinous traits and duties" (10, p. 115). The conception of the self trying desperately to grasp an experience of itself is no longer a stumbling block to life, and the enlightened individual can eat, sleep, and have relations without feeling obligated to himself to do something important for himself in all this. To educate one's being in accord with this principle is not to manipulate a concept of self in order to force learning, but is rather to realize that no concept is superior to its creator:

> To know that you are ignorant is best,
> To know what you do not, is a disease;
> But if you recognize the malady of mind for what it is, then that is health (1, p. 124).

To learn in "ignorance" or teach without teaching a self, requires a definite change, however easy according to the Zen masters, in the psychology of education. However, this must be accomplished or else the impossible dilemma of the self seeking to solve its own problems will be perpetuated:

> The student learns by daily increment.
> The Way is gained by daily loss,
> By letting go, it all gets done;
> The world is won by those who let it go.
> But when you try and try,
> The world is then beyond the winning (1. p. 101).

The import of this poetic admonition should be taken seriously because the underlying philosophical assumptions of any system, including education, have an unavoidable effect upon the individuals within it. Education, whether using the understanding of traditional Western psychology or the enlightenment of the East, will recreate the effects of its assumptions in those it teaches. This perpetuation of socially pervasive attitudes is carefully noted by Watts:

> Freud remained a dualist in his view of human nature, and so long as

> there seems a basic incompatibility between instinct and reason, Eros and civilization, there must remain an insoluble moral problem—to which repression only seems to be a workable answer. Thus in defining the problem of education Freud said: "The child has to learn to control its instincts. To grant it complete freedom, so that it obeys all its impulses without any restrictions, is impossible . . . . Education has therefore to steer its way between the Scylla of giving the instincts free play and the Charybdis of frustrating them." It may be necessary to divide the child against itself for the purpose of learning certain patterns of social behavior, but if the child does not later in life discover that this division was a trick, it turns into a permanently alienated personality (12, p. 189).

Accepting education as a game that does not have the seriousness of some ultimate moral standards for the student or the teacher is not to allow impulsive behavior, since socially developed behavior is just as "real," but to accept any behavior and the education of it for what it is. Rather than learning some conceptual standard as superior to its human creator, the child could then accept his social education as a part of learning to express his enlightened "self." As a Buddhist Sutra says: "the paths of existence are no more than manifestations of your mind itself. They are all like the moon reflected in water or the image in a mirror" (9, p. 105). To allow the child to develop and be taught without the moral, or egoistic pressure of inculcated selfhood could be a great step toward the dissolution of the problem created when we try to educate a concept of self rather than the person himself.

Teaching or learning with the compassion of "nonattachment" rather than the passion of obligation to "self" allows for the freeing of the person from efforts to manipulate him as an object of education. The mind, thus unbound from ideas of what should be or what reality is, can then reflect its education without the anxiety of creating a self, or rather a self-image, that is right and justifiable. Like the mirror, the wise individual learns by wanting "to give life to things, but never to possess them" (1, p. 103).

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EFFECT OF INTERMITTENCY ON STEREOPSIS*

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A. INTRODUCTION

The study about to be reported is one in an extended program investigating the effects of intermittent photic stimulation on the production of sensory end-results. The initial sensory effect was brightness which was found to be maximized when frequencies in the neighborhood of 10 Hz were used (8, 9). Other investigations of brightness followed (16, 17, 19, 20, 22, 23, 24, 29). The effects of stimulus intermittency on the sensing of color were also studied (1, 2, 3, 4, 5, 6, 10, 12, 14, 26).

Effects of stimulus intermittency on visual acuity were likewise studied (7, 11, 12, 13, 15, 18). Still other sensory effects were included (25, 27). Recently, a symposium on the Alternation of Response Theory was published (21), and in it various neurophysiological considerations related to the production of sensory end-results were discussed.

One of the phenomena that came up for the study in the program was stereopsis, binocular perception of three-dimensional space based on retinal disparity. The first study (12) used the Howard-Dolman test, and no decrement in stereopsis due to stimulus intermittency was disclosed. This was contrary to expectation, since a certain frequency range of intermittent stimulation impoverishes visual acuity. It was thought that this impoverishment would be a factor in impairing stereopsis. Ogle (28) has stated that the two phenomena involve similar retinal processes. In a second study of stereopsis, a disk annulus target was used and preliminary results again showed no significant effect on stereopsis. It was concluded that certain crucial stimulus variables (extraneous "cues") must not have been taken into account and adequately controlled.

The present study undertook to determine whether stereopsis could be affected by using a very different sort of a visual target, but did not go so far as to quantify it once demonstrated.

The variables were intermittency rate and pulse-to-cycle fraction (PCF),

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often called light-dark ratio. The latter term is not used here, since we are labelling stimulus input rather than response, such as seeing "light" and "dark." The frequency ranges that produce certain other sensory end-results are already known. It would be expected that if impoverishment of stereopsis were to occur, it would occur in the same ranges and with similar PCFs. Hence the first consideration is determining what happens at certain frequencies and with certain PCFs rather than the determining of the target values that may produce stereopsis effects.

B. METHOD AND PROCEDURE

1. *Apparatus*

The apparatus consisted of three components: (*a*) the eye piece, (*b*) the lighting system, and (*c*) the target.

The lighting source was a 750 W projector, the beam from which was redirected to the target by two mirrors as indicated in Figure 1C. The target was an 8-½-inch × 11-inch matte white surface in the center of which was a 1-½-inch hole bordered by a 1/32-inch black ring. The adjustable element in the target was a ⅜-inch *black dot* centered in the hole just mentioned. The dot was on the end of a transparent rod directed in the line of regard as shown in Figure $1C_5$. The rod was mounted in a block. By sliding the rod, the *dot* could thus be positioned either flush with the front surface of the target (the plane of the black ring) or at any one of three positions (½-, ¼-, or ⅜-inch) either in front of or behind it.

Two pen motors with attached flags were mounted so as to close off the apertures in the eye piece when desired, depending upon the flag position. The flag position is shown in Figure $1C_4$. Intermittency in viewing the target was made possible for the chosen eye by a Grass Model SF stimulator which also controlled PCF. A Tektronix oscilloscope Type 503 monitored the flag action for frequency, duration, and wave form.

2. *Procedure*

The observer's task was to judge whether the black dot was in front of or behind the black ring. The three positions behind and three in front of the ring were each presented 10 times per session, thus 60 judgments were made each session. Five conditions were used for duration and frequency: namely, 8 Hz with a PCF of ¼; 8 Hz, PCF ¾; 15 Hz, PCF ¼ and PCF of ¾; and a steady exposure. The nondominant eye was steadily exposed to the target. Only the dominant eye was given intermittent stimulation. Thus the binocular image was as if the intermittent component

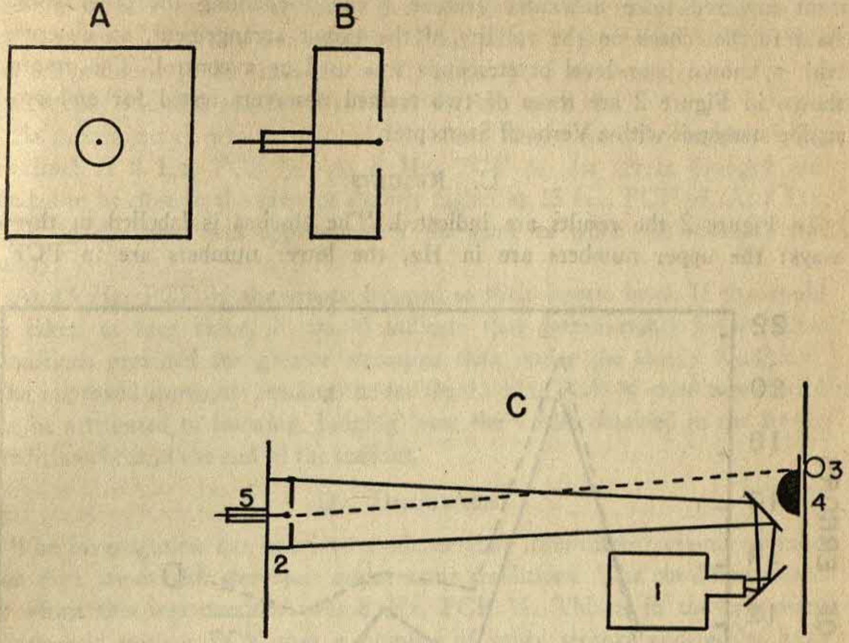

FIGURE 1

Apparatus for Intermittent Stimulation and Study of Stereopsis

A, observer's view of target, consists of a white surface, a narrow black ring bordering a hole, a black dot on the end of a transparent rod. B is side view showing that rod can be moved forward or backward, locating the dot with reference to the target surface. C is the overall setup: 1) Projector; 2) target; 3) eye (each eye peeks thru a small hole in a separate plate, both being adjustable to the observer's interpupillary distance); 4) pen motor flag activator to produce intermittent view of the target; 5) calibrated holder to indicate location of black dot.

from one eye was superimposed on the steady component of the other one.

Once the experiment was in progress, verbal communication was limited to the observer's responses regarding the position of the dot. The positioning of the dot from trial to trial was made unobservable by placing a white card between the observer and the target. This card also insured a constant level of luminosity for the one eye and a continued intermittency for the other eye. Removal of the card signalled the observer to prepare to make the next judgment.

Control for extraneous "cues" was provided by periodic monocular trials in which, of course, the exact position of the dot would not be detectable. Were it to be detectable, it would be an indication that the target arrangement involved some unwanted feature ("cue") enabling the observation. As a further check on the validity of the target arrangement, an observer with a known poor level of stereopsis was used as a control. The results shown in Figure 2 are those of two trained observers tested for and possessing stereopsis with a Verhoeff Stereopter.

C. RESULTS

In Figure 2 the results are indicated. The abscissa is labelled in three ways: the upper numbers are in Hz, the lower numbers are in PCF,

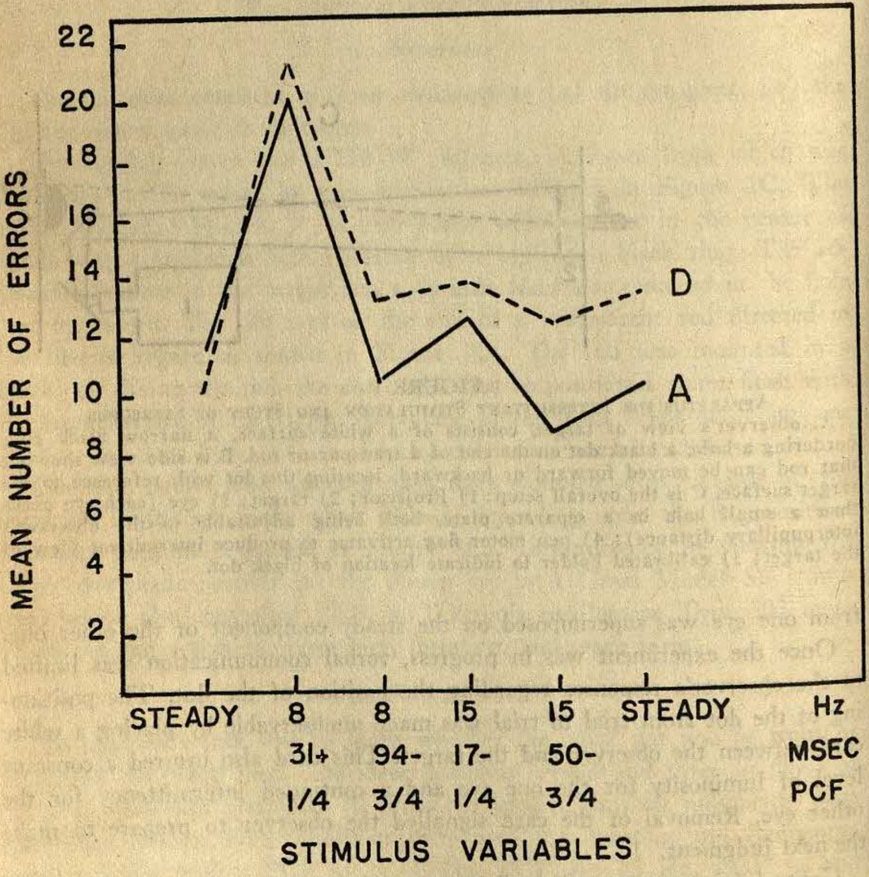

FIGURE 2

RESULTS FROM TWO OBSERVERS

Ordinate indicates mean number of errors for each session of 60 observations. Abscissa labelled in Hz, photic pulse durations and in PCFs.

and the middle numbers represent pulse durations. The ordinate depicts the mean number of errors per observer. Each point is the mean of 300 trials (6 dot positions × 10 trials for each position × 5 sessions), except for the final steady stimulus session where only 5 trials were run.

As intermittency was introduced, the mean errors rose, the number being maximal at 8 Hz, PCF ¼. At 8 Hz, PCF ¾ the errors dropped and tended to be close to the same or slightly higher at 15 Hz, PCF ¼. At 8 Hz, PCF ¾ the level was approximately the same as when the stimulus was steady.

At 15 Hz, PCF ¾ the errors dropped to their lowest level. If this could be taken at face value, it would indicate that intermittency under these conditions provided for greater stereopsis than under the steady conditions. The improved stereopsis readings under the 15 Hz, PCF ¾ condition should not be attributed to learning, judging from the values obtained in the steady condition check at the end of the sessions.

D. DISCUSSION

The investigation has provided evidence that intermittent photic stimulation does impoverish stereopsis under some conditions. The condition tested at which this was maximal was 8 Hz, PCF ¼. This is in the frequency region and with a PCF that a number of other sensory end-results have been shown to be most greatly affected by stimulus intermittency. The PCF (the factor actually varied) seems to be a crucial factor. Whether pulse duration *per se* is crucial is not determined.

The superiority of stereopsis at 15 Hz, PCF ¾ over steady stimulation is not surprising, since a PCF of ¾ in a previous experiment enabled a color-deficient observer to make fewer errors than he did under steady illumination (5).

The investigation has shown that stereopsis is affected by intermittent stimulation of the dominant eye in the same manner as brightness, color, and visual acuity. Further investigation is necessary before a neural explanation of the effect may be suggested. A significant problem for future investigation would be a comparison of the effects of stimulus intermittency on dominant eye sighting when both eyes are subjected to intermittent stimulation. In such a comparison, the two eyes could be stimulated in phase, and also out of phase.

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THE BIPOLARITY OF SEMANTIC SPACE AS RELATED TO CONCEPT COMPLEXITY*[1]

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A. INTRODUCTION

Recent semantic differential research has indicated that semantic space may not have the bipolar structure proposed by Osgood *et al.* (3). "Bipolarity" is imposed through the use of two-dimensional, polar-opposite scales. Green and Goldfried (2) in a monograph used a seven-point unipolar scale to investigate the structure of semantic space. A factor analysis of their data indicated that bipolarity tended to be concept specific rather than a general characteristic of semantic space. In a follow-up study, in this journal, Bentler (1) used a control for acquiescence response set which he believed influenced the findings of Green and Goldfried. Bentler used an adjective checklist to represent each pole of the traditional three dimensions, E, P, and A. This allowed him to use the total number of adjectives checked across all six scales as a measure of acquiescence or extreme response tendency. With acquiescence partialed out, Bentler found correlations in the .70s and concluded that semantic space was approximately bipolar. Bentler also factor analyzed the positive and negative factors (adjectives) for each dimension, finding support for the tri-dimensionality theory of semantic space.

Bentler suggested that the degree of bipolarity along each of the three dimensions may be related to the specific concept and in particular to the quality of abstractness or concreteness of the concept. He hypothesized that highly abstract concepts should elicit little or no bipolarity, while concrete concepts should reveal a great deal of bipolarity. The present study was designed to test this hypothesis.

B. METHOD

The unipolar rating scale technique of Green and Goldfried (2) was used in this study. In this method, the applicability of a set of adjectives to a concept is rated on seven-point rating scales, one scale for each adjec-

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tive. One adjective (descriptor) was selected from Bentler's list for each of the six factors: E+, E—, P+, P—, A+, and A—. The adjectives were selected wherever possible so that a logical opposite could be chosen according to the general semantic differential usage. This could be done for three factors, E+, P+, and P—. Wherever this could not be done, the logical opposite was supplied (i.e., for E—, A+, and A—). This resulted in 12 adjective scales on which each concept was judged. Descriptors selected from the factors and the logical opposites used are presented in Table 1.

The concepts to be rated on the 12 rating scales were selected from Paivio's (4) ratings of concreteness, meaningfulness, and imagery. Three concepts were selected from those having the highest possible concreteness rating (7.00), and a meaningfulness rating which was in the midrange ($\bar{x} = 6.01$). In addition, three concepts were selected from those having the lowest possible concreteness ratings ($\bar{x} = 1.94$) and which could be approximately equated on meaningfulness to the concrete concepts ($\bar{x} = 5.90$).

Table 2 shows the concepts selected and their ratings on concreteness and meaningfulness. Due to the high correlation between concreteness and imag-

TABLE 1
SELECTED DESCRIPTORS REPRESENTING SIX SEMANTIC FACTORS

Adjectives	Logical opposites
(E+) Pleasant	Unpleasant
(E—) Dangerous	Safe*
(P+) Active	Passive
(P—) Quiet	Lively
(A+) Strong	Weak*
(A—) Light	Heavy*

* Indicates that these did not appear as the opposite factor in Bentler's analysis (see text).

TABLE 2
CONCRETENESS AND MEANINGFULNESS RATINGS FOR SELECTED CONCEPTS

Concepts	Concreteness rating	Meaningfulness rating
Concrete		
Macaroni	7.00	6.00
Accordian	7.00	5.87
Automobile	7.00	6.16
$\bar{X}$	7.00	6.01
Abstract		
Happiness	1.94	6.00
Necessity	1.97	5.92
Theory	1.90	5.88
$\bar{X}$	1.94	5.90

ery, it was not possible to equate completely the concepts on this scale and still maintain the large abstract-concrete differences which were desired.

Subjects were 65 college sophomore and junior students who were enrolled in social or developmental psychology classes. These *S*s were presented a six-page booklet. The pages were ordered randomly, and each page was headed by one concept followed by the 12 rating scales. The scales were presented in a different random order on each page. Ratings were requested on each of the six concepts on all 12 scales for each subject. The instructions were read to the subjects by the experimenter. The wording of the instructions followed the suggested format of Osgood *et al.* (3) as closely as possible. The only differences were those necessary for adaptation to a unipolar scale. A brief set of instructions was also included at the top of each page.

Bipolarity was tested with the use of a subject's average rating for concrete concepts on each of the six factors, and his average rating for these adjectival factors for the abstract concepts. Should such a dimension as the evaluative dimension be bipolar, the ratings on the E+ factor should correlate high and negatively with the ratings on the E— factor. If bipolarity is nonexistent, factors of each dimension would be expected to have low or zero correlation.

The total of all of a subject's ratings across all concepts was used as an indicator of his acquiescence. This was partialed out, with the use of partial correlation techniques, from the correlation between factor ratings.

C. RESULTS AND DISCUSSION

Table 3 shows the correlation matrix for abstract and concrete concepts. All coefficients are shown after acquiescence was partialed out. Those coefficients above the diagonal are for the concrete concepts, those below the diagonal are for the abstract concepts.

TABLE 3
CORRELATION MATRIX FOR ABSTRACT AND CONCRETE CONCEPTS WITH ACQUIESCENCE PARTIALED OUT

Factor	E+	E—	P+	P—	A+	A—
E+	—	—.39*	.08	—.20	.27	.08
E—	—.17	—	—.07	.07	—.20	—.22
P+	—.16	—.06	—	—.34*	.13	—.20
P—	.15	.29	.03	—	—.16	.17
A+	.18	—.40	.27	—.21	—	—.31*
A—	—.13	—.11	—.19	—.08	—.00	—

* Indicates significance at the .01 level.

Examination of the matrices shows that for concrete concepts the opposite factors of each dimension, E+ and E—, P+ and P—, and A+ and A—, are correlated negatively and are significantly different from zero as predicted. None of the opposite factors for abstract concepts correlates significantly with the others, also as predicted.

These results support the hypothesis that one of the variables upon which the structure of semantic space depends is the degree of concreteness of the concept. It should be noted further, that even for our most concrete concept, the highest correlation is —.39, while Bentler's lowest correlation after partialing out acquiescence was —.73. This discrepancy may be due to Bentler's failure to cross-validate his results. The scores used to assess bipolarity were computed from the same data used in the factor analytic selection of items for the opposite factors. This discrepancy between studies may also indicate the presence of variables other than the abstractness-concreteness variable affecting the structure of semantic space. Other variables, such as meaningfulness and frequency of conflicting usage, should be investigated. At any rate, it appears that substantial variability in the structure of semantic space for a given concept will be accounted for by its perceived degree of abstractness or concreteness.

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THE RELATIONSHIP OF CUE STRENGTH AND TEMPORAL INTERVAL TO SCHIZOPHRENIC ASSOCIATIVE DISORDERS*

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A. INTRODUCTION

Chapman, Chapman, and Miller (3) have hypothesized that schizophrenics manifest an excessive reliance on the strongest or most usual meaning of words with multiple meanings with a consequent neglect of weaker meanings. They suggest that the extent to which this "exaggerated normal response bias" results in deviant verbal behavior is a function of the strength of contextual cues which indicate the intended meanings; schizophrenics, relative to normals, are incapable of using weak contextual cues. This hypothesis was based primarily upon their findings with items of the following type:

> Item 21. When the farmer bought a herd of cattle, he needed a new pen. This means:
>
> A. He needed a new writing implement.
> B. He needed a new pick-up truck.
> C. He needed a new fenced enclosure.

The intended meaning here is alternative "C," although the answer in alternative "A" is the stronger meaning of *pen.* The contextual cues of a parallel item indicated the stronger meaning of *pen* with one alternative the weaker meaning, fenced enclosure.

Deckner and Blanton (5) attempted to broaden the base of support for Chapman's theory by defining context and strength of association with somewhat different methods from those used by Chapman *et al.* They found, consistent with Chapman's theory, that schizophrenics performed at a level comparable to normals when rewarded for choosing the strong associations to stimulus words but were significantly inferior to normals when rewarded for

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selecting weak associations. They also found, however, that a progressive weakening of contextual cues did not result in a greater rate of deterioration in the performance of schizophrenics than in that of normal controls. The inconsistency of the latter finding with that of Chapman *et al.* was suggested to be related to an attentional deficit in schizophrenia (*cf.* 4) which may have been differentially operative in the two studies because of the different methods used to define context.

The method used by Deckner and Blanton, the cloze technique (12), requires the ability to use contextual cues that are in proximity to the word to be defined. Different frequencies of words were systematically deleted (either every tenth, every eighth, or every fifth) from several passages, and *S*s were instructed to fill in the blanks with an appropriate word by using the contextual cues that remained. Thus, a typical sentence from a cloze passage would be as follows: "The farmer has too —— cows and must build a new barn." As in this example where the deleted word is *many*, the most decisive cues in a cloze task are usually those immediately preceding and/or following the blanks.

On the other hand, the multiple choice format of Chapman *et al.* requires the ability to use critical cues that are spatially and temporally separated from the point of associative choice. In the example above, the most useful cues for defining *pen* are *farmer, herd,* and *cattle.* All these cue words are separated from the multimeaning word and from the correct alternative, "C," by other, less useful words. Since proponents of both attention theory (10, 11) and interference theory (8) have suggested that a basic problem in schizophrenia is heightened distractibility, the difference between the two tasks could be critical. Lang and Buss assert: "In brief, the hypothesis of associative interference has been verified. Schizophrenics have more unique, non-shared associations and these associations, like external distractors, serve to deteriorate performance because of their intrusive nature" [8, p. 85]. "Biological noise" (8) and personal thoughts and emotions, which normals can filter out, are other internal stimuli that can be potent distractors for schizophrenics (10).

The present study was designed to assess the ability of schizophrenics to define appropriately multimeaning words that are temporally separated from cues that indicate a weaker meaning. The prediction was that with a longer temporal interval, schizophrenics will digress toward the stronger meaning to a greater extent than normals. A second purpose was to examine the variable of strength of contextual cue. Chapman *et al.* suggest that when contextual cues are strong, the schizophrenic's ability to discern the intended meaning of multimeaning words should approximate that of normals; when such contextual cues are weak, the schizophrenic's excessive reliance on the strongest meanings of homographs should be manifest. Finally, the variable of premorbid adjustment level was investigated, since there is evidence that schizophrenics who differ along this dimension may differ in their performance on a variety of experimental tasks (6).

B. METHOD

1. *Materials*

One group of 52 college students was given a list of 88 multimeaning words and instructed to rank, in terms of strength, the different meanings of each. Of these words, 37 were retained as having one clearly predominant meaning; only words were retained for which there was better than 79% agreement among the student judges as to which meaning is the strongest. These 37 words and an additional 21 multimeaning words used by Chapman *et al.* (3) were listed on a response form, each followed by one of its *weaker* meanings. The list was presented to a second group of 37 college students who were instructed to respond to each word, as defined, with the three associations they judged to be the most common.

The associations given to each weaker meaning were regarded as cue words by which the weaker meaning could be inferred. The percentage of students who gave a word as an association was taken as an index of the strength of that word as a cue to the weaker meaning of the multimeaning word. Associations given by 50% or more of the judges were regarded as relatively strong cues to the weaker meanings; associations given by between 5 and 15% of the judges were regarded as relatively weak cues to the weaker meanings.

2. *Subjects*

A group of 30 male schizophrenics and a control group of 15 male general medical patients were the *S*s. All *S*s were Veterans Administration Hospital patients. Premorbid adjustment was defined by the Ullmann-Giovannoni (U-G) scale. Fifteen *S*s who obtained scores of 12 or less on the U-G scale were regarded as poor premorbid (PP) schizophrenics; 15 *S*s who obtained scores above 12 were regarded as good premorbid (GP) schizophrenics (13). No *S*s who were under 21 or over 55 years of age, who had an estimated *IQ* score of less than 80 (based on the WAIS Vocabulary subtest), or who were unable to read were included in the study. Differences among the normal, GP, and PP groups in mean age, education, and *IQ* score, and between the

GP and PP groups in mean years since first hospitalization did not reach statistical significance.

3. *Procedure*

By means of a Kodak Carousel slide projector interfaced with a tape recorder, the cue and multimeaning stimulus words were presented to the *S*s. The cue words were always in white, lower case letters (on a dark background), and the stimulus words were always in red, upper case letters. Subjects were instructed to give the meanings of the words with the latter characteristics. They were informed that these words had more than one meaning and that they were to use the word in white, lower case letters as a clue or cue to the appropriate meaning of the word in red, upper case letters. Subjects were given examples and three practice trials before each treatment condition. Subjects were required to read aloud each word as it was presented in order to insure their attention to and correct perception of the words.

On each trial the cue word preceded the stimulus word. In one treatment condition, the interval between presentation of the cue word and stimulus word was one second. In the second treatment condition, this interval was 20 seconds. The cue words were presented for five seconds. A "relaxed set" procedure (7) was followed by informing *S*s that they could respond as soon as they heard a tone, but that they did not *have* to respond immediately after the tone. The stimulus word remained visible for five seconds, and the tone which signaled the response could be given was sounded one second after the stimulus word was removed. After the practice trials, interaction with the *S* was kept at a minimum. The standard reply if a response was unclear was, "Tell me more about it"; or, if both the strong (cue-inappropriate) meaning and weak (cue-appropriate) meaning were given, "Which *one* is correct *this* time?"

Ten different stimulus words and 10 associated cue words were presented under each treatment condition. Five of the cue words in each condition were strong and five were weak. No stimulus or cue word was presented more than once throughout the experiment. The pairs of words were randomly assigned to each treatment condition. The order of the *S*s' participation in the two treatment conditions was counterbalanced.

C. RESULTS

The meanings given by *S*s to each multimeaning word were sorted into one of three exhaustive categories by two college students who were trained on the judging task. The judges worked independently and all information about the study was withheld from them; identifying data on the response sheets were in code. Interrater agreement was found to be 97.2%.

Category 1 was that of the strongest meaning, and category 2 was that of the weaker meaning which had been indicated to the *S*s by a cue word. Each of these meanings was specified with a clear definition for the judges. The third category was that of any response which could not be placed in either category 1 or 2. A primacy error ratio was computed for each *S* at each treatment combination. Similar to the misinterpretation ratio used by Benjamin and Watt (1), this index is equal to the number of strong meaning (category 1) responses divided by the number of strong plus the number of cue-appropriate, weak meaning (category 2) responses. Thus, the primacy error ratio reflects only the theoretically relevant responses, ignoring responses placed in category 3.

Table 1 presents the results of a Groups (Normals *vs.* GP Schizophrenics *vs.* PP Schizophrenics) by Cue Strength (Strong *vs.* Weak) by Temporal Interval (1 second *vs.* 20 seconds) analysis of variance performed on the primacy error ratios.

Contrary to the prediction of the present authors based upon attention theory and interference theory, Temporal Interval had neither significant main effect nor interaction. The significant main effect for Cue Strength indicates that, in general, *S*s made more primacy errors with weak cues than with strong cues. This finding, however, cannot be taken as support for the hypothesis of Chapman *et al.* (3). Rather, the hypothesis implies a Groups by Cue Strength interaction. This interaction was found to be nonsignificant,

TABLE 1
ANALYSIS OF VARIANCE OF PRIMACY ERRORS AS A FUNCTION OF GROUPS, CUE STRENGTH, AND TEMPORAL INTERVAL

Source	*df*	*MS*	*F*
Between subjects	44		
Groups (A)	2	1826.57	1.47
Error	42	1237.86	
Within subjects	135		
Cue Strength (B)	1	5768.67	23.15*
A × B	2	.89	<1
Error	42	249.16	
Temporal Interval (C)	1	63.60	<1
A × C	2	47.83	<1
Error	42	214.90	
B × C	1	7.60	<1
A × B × C	2	212.83	<1
Error	42	309.45	

* $p < .001$.

indicating that the schizophrenics were no more impaired than the normals by the transition from strong to weak cues. Although the Groups main effect did not reach statistical significance, the differences among the means were in the expected directions: Normals $= .13$, GP $= .17$, and PP $= .24$.

Thus, while there appears to be some general impairment on the part of the schizophrenics, with the PP group showing the greater inferiority relative to normals, the impairment was not of the specific type postulated by Chapman. This was also suggested by a similar analysis of variance of category 3 responses. While again only a main effect for Cue Strength was found, indicating more category 3 responses were made with weak cues than strong cues, differences among the normals and two schizophrenic subgroups were in the predicted direction and closely approached significance ($p < .10$).

D. Discussion

The temporal intervals were ineffective in producing the distraction suggested by theorists who hold that internally generated, irrelevant stimuli account for major aspects of schizophrenic behavior. The 20-second interval was undoubtedly long enough for internal distractors to emerge and be operative. In natural language contexts, separations of cue words and multimeaning words by more than 20 seconds would not occur often enough to account for the pervasiveness of the disorder in schizophrenic verbal behavior. Also, it would take no longer than 20 seconds to read one of Chapman's items.

This result, considered in conjunction with those of earlier investigations of word interpretation (e.g., 1, 3, 5) and attentional processes (e.g., 2, 9) in schizophrenia, suggests that stimuli imposed by the present, external environment may be of greater significance than those generated internally. With no experimentally introduced stimuli in the intervals between the cue and multimeaning words, the stimuli that exerted the greatest effect on the associative responses of the schizophrenics, as well as those of the normals, were the cue words. These stimuli tended to evoke appropriate responses, and there was no difference between the schizophrenics and normals in the number of cue-inappropriate, strong-meaning responses. Although in some instances internally generated intrusions may be highly disruptive, the present results suggest they do not occur with sufficient frequency to be a primary factor in schizophrenic associative disorders.

A similar argument can be made with respect to the variable of context. As in the Deckner and Blanton (5) study, the present study found that although the transition from strong to weak contextual cues resulted in impaired performance for both the schizophrenics and normals, the groups were not differentially affected. Contrasted with the findings of Chapman *et al.* (3) who used multiple choice tasks, this finding of the present study also suggests the relative importance of externally imposed distractors. When an appropriate response must be chosen from a set of explicitly provided alternatives, the mere presence of the strongest meaning as an alternative may constitute a contextual cue that differentially distracts the schizophrenic. Yet when the dominant meaning is not externally imposed, as in a free response task, the schizophrenic's tendency to commit the primacy error may be reduced. This hypothesis is currently under investigation by the present authors.

E. Summary

Fifteen good premorbid (GP) schizophrenics, 15 poor premorbid (PP) schizophrenics, and 15 normal control *S*s were presented with contextual cue words that indicated weaker meanings of subsequent multimeaning words. The cue words were either strongly or weakly indicative of the weaker meanings and preceded the multimeaning words by either one second or 20 seconds. The transition from strong to weak cues resulted in more cue-inappropriate, strong-meaning responses for schizophrenics and normals, but the groups were not differentially impaired. The tendency to respond with the strong meanings and neglect the cue-indicated weak meanings was no greater with the 20-second than the one-second interval. The implications of these findings for theories of associative-response bias and distractibility in schizophrenia are discussed with regard to the distinction between distractors that are internally generated and those that are imposed by the present, external environment.

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GROUP RISK TAKING AND EXPECTED VALUES*

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A. INTRODUCTION

One variable that has been given scant attention in the study of group risk taking is the expected value of the decisions. The expected value of any decision is computed by multiplying the probability of success times the reward. Where monetary reward has been used in group risk taking studies (1, 4), the expected values of the decisions were positive and equal for each decision. Marquis and Reitz (3) found that in a gambling situation, decisions on problems with positive expected values were significantly riskier after group discussion, while decisions with negative expected value were significantly more cautious after discussion.

The data presented here are part of a larger experiment (2) dealing with group risk taking. Soon after the experiment began it was discovered that the expected values being utilized were not those used by Wallach *et al.,* so another condition with these expected values was added. The data for this paper, therefore, consist of a comparison between the expected value of Wallach *et al.,* which is held positive and constant, and expected values, which are positive but variable. In all other respects the two treatment groups are the same.

B. METHOD

1. *Subjects*

Subjects were 120 male undergraduates in the introductory psychology courses at Wayne State University. Subjects were randomly assigned to two experimental conditions each consisting of 15 four-man groups.

2. *Procedure*

After each four-man group arrived, the members were seated around a table. On the table, in the middle, was a tape recorder.

All subjects were told that this was an experiment in group decision mak-

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ing. They would first be required to make three decisions individually and then come to a unanimous group decision for each of the three decisions.

The intellectual problem solving items of Wallach, Kogan, and Bem (4) were utilized, as well as their procedure. Subjects were asked to decide at what difficulty level for math, analogies, and antonym questions they would prefer to answer. The more difficult the question the more money that could be won. If the question were answered incorrectly then the subjects would receive no money. The items ranged in difficulty levels from 10 percent to 90 percent. Before the subjects made their individual decisions for the three areas, they were first given some practice questions in math, analogies, and antonyms to acquaint themselves with the difficulty levels. The practice questions were those that had been used by Wallach, Kogan, and Bem. After the subjects attempted the practice questions, they were given the correct answers by the experimenter to give them some indication as to how well they did. Then followed the individual and group decisions with the instructions that one person, who would be randomly chosen (by a pick of cards), would attempt to answer one question from one of the three areas. If the question was answered correctly, then all members of the group were given the amount indicated by the difficulty level. *S*s then, did not know who would answer the question or from which of the three areas the question would be taken.

3. *Experimental Conditions*

a. Condition I. In this condition the rate of payoffs was held constant with an increase of 20¢ for every 10 percent increase in difficulty level. With a constant increase in payoffs the expected value increases to a point and then decreases.

b. Condition II. The same payoffs as used by Wallach, Kogan, and Bem were used in this condition. The expected value for any difficulty level question was .15. Keeping the expected value equal and positive along the range of difficulty levels has the effect of increasing the rate of payoffs. The payoffs for each difficulty level and expected values are presented in Table 1.

C. RESULTS

A comparison of individual to group decisions for both conditions over the three problem solving areas indicates that condition II subjects increased significantly in risk, while condition I subjects remained the same from individual to group decisions (see Table 2).

TABLE 1
Expected Values and Payoffs for the Two Conditions

Difficulty level	Payoff	Expected value
	Condition I	
.10	$ .40	.36
.20	.60	.48
.30	.80	.56
.40	1.00	.60
.50	1.20	.60
.60	1.40	.56
.70	1.60	.48
.80	1.80	.36
.90	2.00	.20
	Condition II	
.10	$ .17	.15
.20	.19	.15
.30	.22	.15
.40	.25	.15
.50	.30	.15
.60	.38	.15
.70	.50	.15
.80	.75	.15
.90	1.50	.15

TABLE 2
Related *t* Tests for Individual to Group Decisions for Conditions I and II

Condition	Mean individual decision	Mean group decision	*t*
I	64.33	63.78	.609
II	61.00	67.56	4.27**

** Significant at .001 (two-tailed).

D. Discussion

As in the Marquis and Reitz study, the expected value in this experiment had a definite effect on group risk taking. For conditions I and II, two groups starting at the same difficulty level face quite different group decisions. This is especially true at the higher difficulty levels. For example, if the group in condition I initially enters the discussion averaging close to .70 in difficulty level, then the members have to decide whether they should stick with $1.60 or go for the .80 difficulty level and $1.80. The decision is whether the additional $.20 is worth the .10 increase in risk. Condition II subjects, at the same difficulty levels, do not have the same decision. Their decision is whether they should stick with $.50 or attempt a 50 percent increase in payoff and go for $.75. The additional $.25 increase may be worth the risk of losing only $.50. While condition II subjects are grappling with that problem, they may ask themselves why they should not go for the .90 difficulty level and increase their payoff 100 percent.

Some differences between this experiment and that of Marquis and Reitz should be noted. Marquis and Reitz explained the concept of expected value orally and in writing to their subjects prior to the individual decisions. In the present study the subjects were not instructed on the expected value nor were they given the expected value for any decision. It appears, therefore, that while the expected value has an effect on group risk taking, it is not necessary for the group to understand the idea of expected value.

The two studies differed somewhat in the tasks that were involved. Marquis and Reitz's subjects had to rely on an external source (roulette wheel) for information as to whether they had won or not. The task was external in the sense that subjects had no control over the outcome of their decisions. Subjects in the present study were confronted with a more internal task, since they did have some control over the outcome of their decisions. The outcome (winning or losing) depended on whether the randomly chosen subject could answer the question or not.

E. SUMMARY

One hundred twenty male subjects were randomly assigned to one of two conditions. Each condition consisted of 15 four-man groups. Subjects were required to make individual and then unanimous group decisions that involved risk. The decisions involved answering questions correctly for money, with more difficult questions paying more money. In condition I the expected value of the decisions was positive and variable, while in condition II the expected value was positive and constant. A significant "risky shift" was found in condition II, while no shift was found in condition I.

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COMPARATIVE ANALYSIS OF CONCURRENT AND PREDICTIVE VALIDITY FOR THE GATB CLERICAL APTITUDE TEST BATTERY*

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A. INTRODUCTION

Concurrent validity and predictive validity are more often that not treated as if they are equivalent concepts, with the notion that concurrent validity can be used effectively to determine expected achievement in various learning areas. The problem of obtaining predictive validity involves a time consideration; with a mobile population as we have in the United States, the cases are scattered widely, and it is difficult to accumulate the follow-up data. This study sought to assess the degree to which concurrent and predictive validity for the GATB Clerical Aptitude Test Battery (CATB) could be effectively substituted for each other.

B. METHOD

1. *Subjects*

Individuals involved in this study included the entire group of 12th-grade students enrolled in the Clerical Course of Instruction at a public high school in a small town in Wisconsin. At the beginning of the study it involved pupils from 17 to 20 years of age, with a modal age of approximately 18. Only five of the subjects (*S*s) were boys, and 49 were girls. All of them were of Caucasian stock, and generally they came from middle-class homes socioeconomically. While a number of them came from farm homes, all of them were planning to develop skills marketable in clerical job-career areas.

2. *Tests Used*

The General Aptitude Test Battery (GATB) was developed by the United States Employment Service for the use of employment counselors in the various State employment offices (2, 3, 4, 6). An early factor analysis

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of 29 different tests involving 2156 men between the ages of 17 to 39 yielded 10 factors involving 15 tests, which are presently used as the GATB battery. Four of these 15 tests, involving four independently organized factors, are characteristically used as the Civil Service Clerical Aptitude Test Battery (CATB). These test scores are described in terms of their factorial content, as follows: (*a*) *G-General Intelligence*. A factor closely akin to Spearman's *g* is being assessed, and it deals with one's ability to adapt to general life situations. (*b*) *V-Verbal Ability*. It is comprised of verbal opposites and assesses the verbal reasoning ability. (*c*) *N-Numerical Ability*. It includes both arithmetic reasoning and computational problems and deals with number ability. (*d*) *Q-Clerical Perception*. It requires the matching of names on a highly timed basis, to determine if they are the same, and assesses clerical accuracy.

In addition to these four tests the United States Employment Service has developed a number of rather parallel forms of Typing Speed tests, which require three minutes of typing under timed standardized conditions. Several forms of these were used for Gross Speed, Number of Errors, and Typing Speed a Year Later.

3. *Test Administration*

All of these tests were administered by an appropriately qualified Wisconsin State Employment Counselor. For the Concurrent Validity, they were administered during the latter part of the high school senior year, as an aspect of the regular school guidance program. Regular school guidance personnel participated in the interpretation of test scores and data. The follow-up testing was accomplished largely by the same Wisconsin State Employment Counselors, but with the cooperation of a number of employment agencies in Wisconsin. It was done a year later.

C. FINDINGS

In Table 1 we have the intercorrelations of the variables used in this study, along with the means (*M*s) and standard deviations (*SD*s) for such data. Inasmuch as the U.S. national norm for the GATB tests is 100, with an *SD* of 20, we observe that the *S*s for this study were above average in all four areas. The Concurrent Validity Index is based on a composite of the four GATB scores and the Typing Test. For the Predictive Validity, the same four GATB scores are used, but the scores for the Typing Test administered a year later are substituted. It should be noted that the *M*s for

TABLE 1
INTERCORRELATION OF VARIABLES
($N = 54$)

Variables	1	2	3	4	5	6	7	8	9	10
Sex										
1. M = 1, F = 2		—.225*	—.257	—.015	—.126	—.182	.101	—.105	—.139	.045
GATB scores										
2. G-General			.639	.755	.517	.332	—.137	.254	.317	—.038
3. V-Verbal				.260	.374	.353	—.113	—.007	.238	.100
4. N-Numerical					.457	.326	—.171	.400	.379	.015
5. Q-Clerical						.358	—.362	.346	.377	.056
Typing										
6. Gross Speed							—.136	.426	.459	.136
7. No. Errors								—.522	—.586	—.009
Validity										
8. Concurrent									.715	—.190
9. Predictive										.293
Typing Speed a Year Later										
10. 1 = loss, 2 = gain										
Mean	19.1	106.9	105.4	106.6	117.5	50.4	6.4	714.4	765.9	1.67
SD	0.3	13.3	11.1	12.7	14.5	8.8	4.6	133.8	123.4	0.49

* An r of .260 is statistically significant at the .05 level; an r of .330 is statistically significant at the .01 level.

both the Concurrent and Predictive Validity scores are also above average in relation to U.S. national norms.

The data for Table 2 were obtained from a principal components factor analysis and based on four extracted factors with 1.00 eigen value or better. The factors were then rotated orthogonally to maximize loadings as a means for interpreting factorial content. The four factors extracted accounted for 74.9 percent of the total variance present, with the first factor accounting for 36.8 percent of the variance. On the basis of the various test descriptions and the rotated factor loadings, the four factors were defined as follows: *Factor I*—General Intelligence; *Factor II*—Concurrent Validity, comprised factorially of Typing Errors, Typing Speed, Clerical Accuracy, and Numerical Ability; *Factor III*—Predictive Validity, comprised factorially of the Typing Speed a Year Later; *Factor IV*—Verbal Intelligence, with emphasis on verbal reasoning.

TABLE 2
VARIMAX FACTOR LOADINGS
$(N = 54)$

Variables	I	II	III	IV	Identification
Sex					
1. M = 1, F = 2	—.047	.112	.089	*.904*	IV
GATB scores					
2. G-General	*.927*	—.066	—.060	—.159	I
3. V-Verbal	.625	.084	.232	*—.480*	IV
4. N-Numerical	.826	*—.241*	—.073	.225	II
5. Q-Clerical	.626	*—.355*	.059	—.073	II
Typing					
6. Gross Speed	.412	*—.393*	.269	—.249	II
7. No. Errors	—.033	*.786*	.002	.077	II
Validity					
8. Concurrent	.206	*—.874*	—.224	.033	II
9. Predictive	.256	—.828	*.325*	—.067	III
Typing Speed a Year Later					
10. 1 = loss, 2 = gain	—.008	—.011	*.958*	.061	III

Table 3 contains the data for comparing Concurrent and Predictive Validity and is based on a "Stepwise Multiple Correlation" statistical technique (5). All multiple *R*s reported are appropriately corrected for shrinkage or bias (R_c). By use of the Hotelling formula, a t test was accomplished for correlated *R*s between the maximum R_c obtained for Concurrent Validity with all seven variables of .688, and the corresponding R_c of .707 for Predictive

TABLE 3
STEPWISE MULTIPLE CORRELATION AGAINST SELECT DEPENDENT VARIABLES
($N = 54$)

Variables	8. Concurrent Validity *Step* R_c	8. Concurrent Validity *Step* R_c	9. Predictive Validity *Step* R_c	9. Predictive Validity *Step* R_c	10. Typing Success *Step* R_c	6. Typing Speed *Step* R_c	6. Typing Speed *Step* R_c	7. Typing Errors *Step* R_c
Sex								
1. M = 1, F = 2	6(.688)	4(.441)	4(.707)	3(.425)	5(.135)		5(.489)	3(.362)
GATB scores								
2. G-General	5(.688)	5(.441)	7(.707)	5(.425)	2(.135)	4(.421)	4(.489)	2(.362)
3. V-Verbal	4 .688	3 .441	6(.707)	4(.425)	3(.135)	2 .409	3(.489)	5(.362)
4. N-Numerical	3 .652	1 .400	3 .707	1 .379	4(.135)	3 .421	2 .489	4(.362)
5. Q-Clerical	7(.688)	2 .423	5(.707)	2 .425	6(.135)	1 .357	1 .357	1 .362
Typing								
6. Gross Speed	2 .628		2 .689		1 .135			6(.362)
7. No. Errors	1 .522		1 .586		7(.135)			
Validity								
8. Concurrent								
9. Predictive								
Typing Speed a Year Later								
10. 1 = loss, 2 = gain								

Validity. The *t* value obtained is .156, which is not statistically significant. Accordingly, we can say on the basis of data from this study that the referenced GATB formula for Concurrent Validity for the CATB may be effectively substituted for Predictive Validity. From Table 1 we observe that the Concurrent and Predictive Validity scores have a correlation of .715, which supports the notion that they have a high level of common variance.

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BEHAVIORAL CORRELATES OF THE EEG IN DELINQUENTS*[1]

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A. INTRODUCTION

This paper reports a study in which two delinquent groups, divided in terms of presence or absence of definitive signs of electroencephalogram (EEG) dysrhythmia, were matched with normal *S*s and given a battery of tests measuring (*a*) extroversion-neuroticism, (*b*) high risk taking, (*c*) psychomotor inhibition, and (*d*) future-past discrepancy ratings.

The selection of delinquent *S*s, based on the presence of definitive signs of cerebral dysrhythmia on the EEG, was made independently at the outset in order to test whether EEG dysrhythmic delinquents, in particular, and delinquents, in general, showed personality traits described by Eysenck as extroverted neuroticism. Eysenck (2) theorized that delinquents failed to condition rapidly and were bound to be slow learners of social mores. The Maudsley Personality Inventory, a reliable measure of extroversion and neuroticism, was used to test his theory of delinquency. Behavioral correlates of delinquency selected for this study were primarily nonverbal by design. Thus, while the theoretical basis of the study was derived from Eysenck's work, the tests were selected on the basis of their proven utility for research on behavior correlates of the EEG. The hypotheses tested were as follows: (*a*) EEG dysrhythmic delinquents differ from nondysrhythmic delinquents on the four behavioral measures; and (*b*) the combined delinquent groups differ from nondelinquents on the same measures.

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[1] This study is based on a Doctoral dissertation submitted to the Department of Psychology, University of Kentucky. The author is especially indebted to Jesse G. Harris, Committee Chairman, for his invaluable help, and to James S. Calvin and Abraham Wikler for theoretical clarifications and guidance. The writer also gratefully acknowledges the assistance of C. I. Schwartz, M.D., Chief of Staff, and C. H. Sparks, Electronics Technician, Veterans Administration Hospital, Lexington, Kentucky.

B. METHOD

1. *Subjects*

Normal *S*s ($N = 23$) were selected by school counselors from four high schools in Lexington, Kentucky. Their *IQ* range was 84-134. The *S*s for the two experimental groups ($N = 43$) were selected from four institutions for delinquents. Following a preliminary selection of the dysrhythmic group, the written EEG reports on 50 delinquents were presented for an evaluation by an independent encephalographer.[2] These reports consisted of 27 cases judged "dysrhythmic" and 23 judged "nondysrhythmic." Seven of the dysrhythmic reports were deemed "questionable" by the independent judge and were eliminated from the study. Thus, the two delinquent groups consisted of 20 dysrhythmics and 23 nondysrhythmics. The groups were matched for race, sex, *IQ*, age, and educational level.

2. *Procedure*

The *S*s were tested in classrooms, in groups of three to five. The *E* was introduced as a psychologist conducting research on learning. The *S*s were informed that test results would have no bearing on their status in the institution. The sequence of task presentation began with the Maudsley Personality Inventory (MPI), followed by the learning task of Playing Minimax Games (PMG); the Spiral Test of Motor Inhibition (ST); and self-ratings of present, past, and future on an inventory of personal constructs (PC).

Materials for the learning task (PMG) consisted of 100 matrices printed on 10 sheets of paper administered during two sessions. Following Brayer (1), each matrix was devised as a 3×3, two-person, zero-sum, strictly determined game in which *S* was placed in the role of playing against *E*. A detailed set of instructions provided *S*s with rules of the game, as well as examples to solve. Each administration of 100 matrices was designed to favor those playing minimax consistently. An *S* who did not learn this strategy was bound to lose in the long run. During the first administration *E* played 90 percent minimax, while two days later on a second administration of the same task, he played 70 percent minimax.

Following a rest period *E* administered the Spiral Test of Motor Inhibition (ST), which involved tracing with a pencil a pathway through a spiral, first, at a normal speed, and then as slowly as possible without actually stopping. The time difference between the two phases represented the m sure of motor inhibition.

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[2] The writer is indebted to Dr. Abraham Wikler, Professor of Psychiatry, Medical Center, University of Kentucky, for his services as an independent judge of all EEG reports.

The final task consisted of self-ratings on 32 personal constructs (PC compiled from research by Lederman (7) and Kasper (5), on a nine-poi scale. The *S*s were asked to rate themselves on each personal construct as th perceived themselves at present, in the past, and in the future. Person constructs were presented with extremes (e.g., "likes to be with people" a "likes to be alone") anchoring the ends of the nine-point scale.

C. Results

Means and standard deviations of normal, dysrhythmic, and nondysrhyt mic delinquents on all behavioral measures are given in Table 1.

TABLE 1
Means and Standard Deviations of Normal, Dysrhythmic, and Nondysrhythmic Delinquents on All Behavioral Measures

	MPI Extroversion		MPI Neuroticism		PMG Minimax %		ST Time in min.		PC Future Past	
*S*s	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SI*
Normal	30.4	4.4	28.0	8.6	81.4	15.9	4.1	3.2	50.1	28
Dysrhythmic	29.1	7.3	28.7	8.2	69.5	20.3	1.5	1.2	78.3	33
Nondysrhythmic	31.9	6.8	29.2	9.6	67.3	27.1	3.4	3.5	66.0	37

MPI. Mean scores for MPI extroversion and neuroticism failed to sho significant differences between EEG dysrhythmic and nondysrhythmic delin quents.

PMG. There were no significant differences between the two delinquen groups, with use of 20 consecutive minimax games without error as a master criterion. The difference between normal and delinquent groups, howeve was significant. Similar results were found when delinquent subgroups wer compared separately and with normals for the first and second 50 trials. two-way analysis of variance of the results of MPI and PMG on two ad minstrations failed to show any significant differences between the two EE groups of delinquents.

ST. The differences between delinquent and normal groups on the Spira Test had to be assessed by a nonparametric test (the Wilcoxon ranks test) Results indicated that dysrhythmic delinquents showed significantly less moto inhibition than nondysrhythmic *S*s and that both groups differed significantl from normal *S*s.

PC inventory. Comparisons of "past minus future" ratings were made by use of Hotelling *T*-square tests. The data showed a significant difference between the two delinquent groups, with EEG dysrhythmic delinquents being more discrepant in their time ratings of constructs than the nondysrhythmic group.

The time spent by each *S* in tracing through a spiral was significantly shorter for delinquents than for normals. The discrepancy between past and future ratings on 32 constructs was also significantly higher in delinquents than in normals. This difference was quite manifest on constructs involving relations with others. Thus, while results were not definitive for the first hypothesis, they were for the second, suggesting differences between normal and delinquent groups on all behavioral measures.

D. DISCUSSION

The results of this study support in part only the main thesis of significant behavioral concomitants to EEG dysrhythmia in delinquents. The MPI and PMG did not show a significant relationship between dysrhythmia and behavior. That two other tests, ST and PC, yielded significant differences between dsyrhythmic and nondysrhythmic groups underscores the need for a variety of psychophysiological measures of sensory and time mechanisms, such as those devised by Lacey (6) or Schacter and Latané (9). Hare (4) had suggested that what was involved in the presumed cortical immaturity of dysrhythmic delinquents was a malfunction of some limbic inhibitory mechanism. These mechanisms are obviously less manifest in paper-and-pencil tasks, such as those employed in this study, than they are in, say, galvanic skin or cardiac responses.

The MPI and PMG data suggest that EEG dysrhythmic *S*s are not different from nondysrhythmic *S*s in personality traits of neurotic extroversion and learning to play at moderate risks. Eysenck's contention that reactive inhibition builds up rapidly in extroverts would call for a slow rate of learning among dysrhythmic delinquents, and this was not the case in this study. Introverts did not show a significant increase in minimax play over extroverts. Furthermore, the MPI data failed to confirm his predictions of a high frequency of extroverted neurotics among delinquents. The two EEG groups were in fact more alike than different on the MPI. While these findings raised some doubts about Eysenck's (2) contentions on delinquency, they are by no means conclusive in this regard. Further research is under investigation with a scale that isolates the crucial variable in extroversion relevant to delinquency. Eysenck and Eysenck (3) suggest that extroversion has both sociability and impulsivity components, and that only the latter is correlated with delinquency.

The significant differences between normal and delinquent *S*s in playing minimax games deserve further attention. The host of variables involved in the wording of instructions, administration, and design makes it a more complex task than originally intended. To the extent that it was a learning task, the results were consistent with the expectation that even bright delinquents would perform poorly on school tasks demanding conformity or compliance with a set of rules. However, if the experiment is one involving a personality factor of self-regulation, defined as taking moderate (minimax) *vs.* high (maximax) risks, it would still be an extrapolation to assume that such a measure was negatively correlated with extroverted neuroticism, which it was not. It is more parsimonious to account for the differences between normal and delinquent *S*s on PMG by suggesting that delinquent *S*s were less motivated to do well on the task than were the normal *S*s. Although subjective reports from all *S*s affirmed that the task was "interesting," there was no evidence that delinquents were as motivated for these games as they would have been in gambling situations, such as street-corner games. The significant difference, perhaps, is that delinquents paid "lip-service" to the rules.

Results of the Spiral Test confirmed an earlier finding by Porteus (8) that the typical delinquent response is marked by careless, haphazard work, persistent disregard of instructions, and satisfaction with an inferior grade of workmanship in the task. Further research is needed to identify the basis of this poor motoric control either as a manifestation of conditioning or as a psychophysiological failure associated with cortical immaturity.

Results of the PC ratings support the contention that EEG dysrhythmic *S*s have a defective sense of timing. The discrepancy in ratings of the future as compared to the past raises a similar question to that raised about ST: namely, whether it is poor conditioning to instructions or a physiological deficit associated with the high incidence of EEG dysrhythmia. The ST and PC findings indicate that the delinquent is present oriented and that his behavior is not guided by the possibility of future consequences which exist in a vague, evanescent way.

E. SUMMARY

Two delinquent groups divided in terms of presence or absence of EEG dysrhythmic signs were matched with normal subjects and given a battery of tests measuring (*a*) extroversion-neuroticism, (*b*) risk taking, (*c*) psychomotor inhibition, and (*d*) future-past discrepancy ratings. Results showed no significant differences between the two EEG groups on the first two measures, but there were significant differences on the last two. Further research on measures of sensory and motor control may still support the EEG as a reliable predictor of developmental characteristics of delinquents. All tests showed significant differences between delinquent and normal subjects.

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Psychophysiological changes after cryothalamotomy for parkinsonism . . . 149
By Eric Levita and Manuel Riklan

The effects of manifest anxiety and practice on performance of a complex reaction time task 155
By Esteban L. Olmedo and Roger E. Kirk

Trustfulness and suspiciousness as a function of liberal or conservative church membership: A field experiment 163
By R. Kent TeVault, Gordon B. Forbes, and Henry F. Gromoll

Creativity as a function of field independence and dogmatism 165
By Fred W. Ohnmacht and Robert F. McMorris

Maternal child rearing attitudes in Hutterite communal society 169
By Shirin Schludermann and Eduard Schludermann

(OVER)

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A semantic differential study of the meaning of personality test items to children from different socioeconomic groups 179
By Warren S. Williams

The effectiveness of time-out in reducing maladaptive behavior of autistic and retarded children 189
By John R. Husted, Patricia Hall, and Bill Agin

The relationship between self-esteem and perceived reciprocal liking: A sociometric test of the theory of cognitive balance 197
By William E. Simon and Edward Bernstein

Geotactic orientation of *Liguus fasciatus* 203
By Peter O. Peretti

Adjustment to same sex and opposite sex in coeducational and noncoeducational high schools 209
By Federico M. V. Tamayo, Marc J. Haberman, Mary L. Zapp, and William C. Horne

Response set analysis of a paternal attitude research instrument (PARI) . 213
By Shirin Schludermann and Eduard Schludermann

Personality styles of student activists 221
By Robert A. Pierce and Allan J. Schwarz

A preliminary note on the evaluation of those upon whom one depends . . 233
By David Lester

Reliability of demographic and job related information 237
By Jeanne M. Erickson, Blair W. McDonald, and E. K. Eric Gunderson

Influence of age, sex, and *IQ* differences on behavior of profound retardates as measured by the rating scale technique 243
By Charles Elmer Lyle and Sally Baskin Thomas

A comparison of two approaches to the analysis of personality differences . 257
By Louis K. Sharpe and Robert A. Peterson

A survey of fear of pregnancy and depression 263
By S. Jerome Kutner

Manifested anxiety in Chinese and American children 273
By Lian-Hwang Chiu

Cognitive capacity of very young children: Yet another replication . . . 285
By Ann Higgins-Trenk and William R. Looft

Comparison of albino rats and mongolian gerbils on the visual cliff . . . 291
By Peter O. Peretti

The effectiveness of a "recreational" and "therapeutic" encounter with psychiatric patients 295
By Charles W. Lachenmeyer

Postlist rehearsal and the recency effect of serial recall 299
By Gary F. Meunier, Jo Ann Meunier, and Douglas Ritz

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PSYCHOPHYSIOLOGICAL CHANGES AFTER CRYOTHALAMOTOMY FOR PARKINSONISM*[1]

St. Barnabas Hospital, Bronx, New York

ERIC LEVITA[2] AND MANUEL RIKLAN

A. INTRODUCTION

It has been thought that lesions involving subcortical structures may affect drive level, initiative, and energy (5; 8; 11, pp. 233-236 and 294-304) which should be related to psychophysiological arousal. Moreover, the important role played by some thalamic nuclei in the maintenance and modulation of such arousal through nonspecific thalamo-cortical systems has been confirmed in previous investigations (4, 9, 10). And, any behavioral function may involve arousal to some extent (11, pp. 241-244 and 310-311).

Parkinsonian patients undergoing cryothalamotomy, generally involving the ventrolateral region, for the relief of tremor and rigidity (2) were studied. The use of parkinsonian patients was predicated on the fact that parkinsonism and therapeutic surgical intervention are ordinarily associated with subcortical involvement (7; 11, pp. 19 and 75). Electromyographic (EMG) and heart-rate recordings were used. These measures were selected because they may be expected to reflect fluctuations in level of psychophysiological arousal based on differing organismic systems (3, p. 263). The specific purpose of the present report was to evaluate changes in measures of arousal as a function of surgically induced thalamic lesions.

B. METHOD

Electromyograms (EMG) and heart-rate (EKG) records were obtained individually in all cases. Initial recordings were derived one to three days before surgery. Retesting was carried out a mean of 10.6 days following cryothalamotomy, and follow-up evaluations were obtained a mean of 153

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[1] This research was supported in part by The John A. Hartford Foundation, New York City.

[2] Presently also at New York University Medical Center (IRM) and Queens General Hospital Center, New York City.

days after surgery. For unoperated patients, recordings were obtained on three occasions and at similar time intervals.

1. *Subjects*

Subjects were parkinsonian patients assigned to one of four groups. Cerebral involvement was inferred from predominant peripheral neurological symptoms. One group consisted of 15 subjects undergoing unilateral right cryosurgery; a second group consisted of 15 unilateral left brain operates; while 13 bilaterally operated subjects were assigned to a third group. A sample of 12 unoperated parkinsonian patients constituted the fourth, or control, group. These control patients did not undergo surgery, although they were suitable surgical candidates on the basis of medical, neurological, and psychological evaluations. They had deferred or avoided surgery for reasons that were not relevant to the present study, such as unwillingness to interrupt work, preference for delaying surgery, among others.

Mean age, education, length of illness, sex distribution, and mean time intervals between successive testing are shown for all groups in Table 1. No significant differences were found between the groups on any of the relevant variables ($.10 < p < .70$). Moreover, it has been previously established that EMG ratings and heart rate are independent of sex, age, education, and laterality or severity of neurological symptoms in parkinsonian patients (6).

2. *Instruments*

EMG and EKG performance was evaluated as follows:

a. Electromyographic ratings (EMG). Recordings for a period of 10 minutes were obtained with an Offner Type T electroencephalograph following application of two silver disc electrodes over the region of the sternocleidomastoid muscle on each side of the neck. Ratings were based on a three-point scale with 1 corresponding to the smallest and 3 denoting greatest extent of arousal. Prior to test administration, patients spent a period of 15 minutes for adaptation. Following such adaptation, indicated by the achievement of stable performance, test recording was initiated under testing conditions. No measures were derived under conditions of induced stress. All patients were tested under the same temporal and environmental conditions, specifically during early afternoon hours and in the same clinical laboratory room for all sessions. Interrater and test-retest reliabilities of .87 and .91, respectively, were significant beyond the .01 level. Reliability findings were derived from a preliminary study of 15 consecutively admitted parkinsonians. A gross esti-

TABLE 1

MEANS FOR AGE, EDUCATION, LENGTH OF ILLNESS, AND TEST-RETEST INTERVALS OF PARKINSONIANS

Patient groups	Sex M	Sex F	Age	Education (years)	Length of illness (years)	Postoperative test interval (days)	Long range test interval (days)
Unilateral left brain operates	9	6	57.13	12.60	5.47	9.2	147.1
Unilateral right brain operates	9	6	59.73	10.07	5.27	8.6	161.3
Bilateral brain operates	6	7	60.15	10.85	7.46	13.9	147.5
Unoperated parkinsonians	7	5	59.51	9.36	4.83	14.6	155.7

Note: No significant differences obtained between the groups on any variable at the .05 level.

mate of diffuse EMG activity was deemed adequate for the purpose of this study. It should be mentioned, nonetheless, that choice of electrodes, effects of distance between electrodes and recording units, and influence of activity accruing from posture and pathology are of the greatest importance for the precise investigation of action potentials involving specific muscles, deep muscles, and fine movements. The restrictions imposed by variations in these parameters have been very clearly described (1, pp. 23-26 and 46-47).

b. Heart rate (EKG). Electrocardiograms were recorded for a period of 10 minutes by means of the Offner Type T electroencephalograph under the conditions described above. From this recording, five samples of a duration of 10 seconds each were selected on a random basis, and the heart rate was determined for each time interval. The sum of these EKG scores over the five time intervals, divided by 5 and multiplied by 6, defined the mean cardiac rate used. Since the scores were derived directly from the EKG and were based simply on frequency counting, no reliability study was deemed necessary in this instance.

C. RESULTS

Changes in performance were assessed as a function of all treatment conditions. Kruskal-Wallis one-way analyses of variance (13, pp. 184-193) yielded H values of 3.96 and 2.69 with $p > .20$ and .30, respectively, for pre- to postoperative and preoperative to follow-up changes on EMG ratings. With regard to heart rate, H values of 3.54 and 1.73 with $p > .30$ and .50, respectively, were obtained for the corresponding changes. It follows that alterations in EMG and EKG performance could not be attributed to differences *between* groups or treatment conditions.

Changes from initial to retest and follow-up performance were evaluated within groups. Such alterations in EMG and EKG ratings were assessed through Wilcoxon matched-pairs signed-ranks tests (13, pp. 75-83). None of the comparisons within groups reached significance at the .05 level on the basis of two-tailed tests.

D. DISCUSSION

While inferences drawn from thalamic lesions may not apply to subcortical systems in general, and while limitations intrinsic to this report may require caution, the following conclusions seemed warranted:

1. Significant changes could not be detected in EMG and EKG as a function of unilateral or bilateral thalamic surgery.
2. Evaluation of intragroup alterations failed to confirm significant changes in EMG or EKG as a function of time.

Possible contamination of EMG activity by neuromuscular rigidity in case of parkinsonian *S*s may cast doubt on a discussion of arousal in te of EMG ratings. However, the absence of EMG changes in the face postoperative improvement in rigidity coupled with a failure to observ significant relationship between rigidity and EMG performance ($r =$ with $p > .05$) would not seem to support such a viewpoint. It is theref conceivable that EMG and EKG measures failed to reflect changes beca the surgical lesions encompassed a zone that was too restricted to aff arousal. Indeed, arousal has been generally associated with systems hav wide distributions and typically involving a considerable area (4, 8, 9, 11).

An alternative interpretation might suggest a great deal of plasticity psychophysiological arousal. It might be contended that pre- and postop ative changes in arousal are obscured by the effects of medications used symptomatic alleviation in parkinsonism. Some of these drugs apparen depress brain-stem activating systems (12) and may thus affect level activation. However, patients generally remained on the same pharmaceuti regimen before and after surgery, as well as during the follow-up peri Moreover, each subject served as his own "control" under virtually u changed conditions of medication before and after operative interventi Testing would therefore appear to have taken place under identical ph macological conditions and may justify the interpretation of changes in p chophysiological arousal as a function of surgically induced lesions and th interaction with continuing disease processes in the case of follow-up evalu tions.

Whatever the case, it must be remembered that EMG and EKG ratin constitute only two measures of arousal which are related to some exte ($r = .42$ with $p < .05$). This does not necessarily justify generalization the entire spectrum of arousal. Finally, these measures might not be su ciently sensitive or refined for the assessment of change in the present conte

E. SUMMARY

Absence of surgical intervention and imposition of unilateral or bilate thalamic lesions in parkinsonian patients were not associated with chan in EMG or EKG performance in the immediate postoperative or follow- period. Significant alterations in EMG or EKG performance could not elicited within groups as a function of time. Contamination of these findi by differences in the rate of habituation to the experimental situation d therefore not seem likely.

The plasticity of psychophysiological arousal was suggested, and the sible association of such arousal functions with widely distributed neurological correlates was discussed in relation to these findings.

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THE EFFECTS OF MANIFEST ANXIETY AND PRACTICE ON PERFORMANCE OF A COMPLEX REACTION TIME TASK*

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A. INTRODUCTION

The present experiment investigated the effects of manifest anxiety, as measured by the Taylor Manifest Anxiety Scale, MAS (7), and practice on the performance of a complex reaction time task. The literature on the relationship between manifest anxiety and complex reaction time contains conflicting results. Farber and Spence (2) found that manifest anxiety affected neither simple nor choice reaction time. Similar negative findings were reported by Noble and Hays (6) and Allen (1). On the other hand, Wassenaar (8) found a negative correlation between manifest anxiety and complex reaction time.

Total reaction time may be partitioned into a premotor component, which is defined as the interval between stimulus onset and response initiation, and a motor component, the interval between response initiation and response completion. These components are uncorrelated (3, 4). The present experiment was designed to answer the following questions: (*a*) Is manifest anxiety related to performance on a complex reaction time task? (*b*) If so, is it related to the premotor component, to the motor component, or to both? (*c*) Is the relationship the same for premotor and motor reaction time? (*d*) Are the two components affected by practice? (*e*) Does manifest anxiety interact with practice for either component?

B. METHOD

1. *Subjects*

Forty-four male undergraduate students at Baylor University in Waco, Texas, were selected from a group of volunteers on the basis of their scores on the 50-item MAS. Twenty-two students whose scores were 20 or higher were classified as high-anxious; 22 students whose scores were 9 or less were

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classified as low-anxious. The mean scores for the high- and low-anxious groups were 25.4 and 7.2, respectively.

2. *Apparatus*

The apparatus consisted of a stimulus-response panel, stimulus programming equipment, and response recording equipment. The stimulus-response display consisted of a 16- by 25-inch panel on which nine light bulbs were arranged in a 3 × 3 matrix. The bulbs were separated from each other by 2.25 inches. A microswitch was positioned one-half inch above each light bulb, and a 2- × 2-inch plexiglass plate was hinge-mounted over each microswitch.

The stimulus-response panel was mounted at a 35-degree angle on a table. A telegraph key was located on the table three inches in front of the panel. An auditory ready signal, 2.8 KHz tone, was given by a Sonalert model SC628 that was mounted behind the stimulus-response panel. The programming and recording equipment, which was located in an adjacent room, measured time to the nearest one-thousandth of a second and recorded it on punched paper tape.

3. *Procedure*

Subjects were tested individually; each session lasted approximately one hour. Instructions were prerecorded on magnetic tape and presented by means of a tape recorder. Each *S* received 100 stimulus presentations at the rate of one every 30 seconds. The one-second ready signal was presented three seconds prior to each stimulus. Between presentations of the stimuli, an *S* rested his hand on the telegraph key. On each trial two light bulbs located in different rows and columns were turned on simultaneously, leaving only one row and one column without illuminated bulbs. The *S* was instructed to lift his hand from the telegraph key as quickly as possible and press the plexiglass plate located at the intersection of the unlit row and unlit column. A trial was terminated when the subject made the correct response or after the stimulus pattern had been presented for five seconds. The sequence of stimulus presentations was randomized for each block of 10 trials to prevent *S*s from learning the sequence pattern and to control for the different positions of the response plates relative to the start position. Two measures of reaction time were recorded: (*a*) time from light onset to release of the telegraph key and (*b*) time from release of the telegraph key to activation of the microswitch under the plexiglass plate. These measures were called premotor reaction time and motor reaction time, respectively. The sum of these two times was the total reaction time. The number of errors each subject made was also recorded.

C. Results

A summary of the *S*s' performance on the complex reaction time task is presented in Table 1. The correlation between premotor and motor reaction times based on data for all of the *S*s was not significant ($r = .002$). The correlation coefficients calculated separately for high-anxious *S*s ($r = .035$) and for low-anxious *S*s ($r = .038$) were also insignificant.

Table 2 presents the analyses of variance for the four dependent variables. The data were analyzed for each dependent variable by means of a split-plot factorial design, type SPF-2.9 (5). The design had nonrepeated measures on treatment A (manifest anxiety) and repeated measures on treatment B (practice). For purposes of analysis the practice trials were grouped into blocks of 10 trials each. The first block of 10 practice trials was considered warm-up and was not analyzed. Hence treatment B consisted of the second through the tenth blocks of trials.

The statistical analyses were performed on log transformed data, but even with this transformation the assumption of symmetry of the variance-covariance matrices was not tenable for any of the dependent variables. Consequently all F tests involving the repeated measures factor, practice, were performed by means of the Geisser-Greenhouse conservative F test (5, p. 262).

The analysis of the error data yielded neither significant main effects nor a significant interaction. However, significant practice effects were found for premotor, motor, and total reaction times. The main effects F ratio for manifest anxiety was significant only for motor reaction time. None of the interactions between manifest anxiety and practice was significant.

Figure 1 illustrates the effects of practice on motor reaction time for high- and low-anxious subjects. The similarity of the two curves is consistent with the insignificant interaction F ratio for manifest anxiety and practice. As is shown in Figure 1, low-anxious subjects had consistently shorter motor reaction times than high-anxious *S*s.

D. Discussion

The finding that mean motor reaction time was shorter for low-anxious *S*s than for high-anxious *S*s supports the hypothesis, derived from Hull-Spence theory (2), that an increase in drive leads to poorer performance on a complex task. Although the sample of low-anxious *S*s had a shorter mean

TABLE 1

MEANS AND STANDARD DEVIATIONS FOR THE FOUR PERFORMANCE MEASURES FOR HIGH-ANXIOUS SUBJECTS, LOW-ANXIOUS SUBJECTS, AND COMBINED GROUPS

Group	Number of errors		Premotor reaction time in seconds		Motor reaction time in seconds		Total reaction time in seconds	
	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*	$\bar{X}$	*SD*
High-anxious	.879	1.254	.594	.213	.661	.408	1.255	.467
Low-anxious	.863	1.503	.659	.303	.488	.246	1.147	.398
Combined high- and low-anxious	.871	1.384	.626	.264	.574	.348	1.201	.437

TABLE 2
ANALYSES OF VARIANCE OF PERFORMANCE MEASURES[a]

Source	*df*	Errors *MS*	Errors *F*	Premotor reaction time *MS*	Premotor reaction time *F*	Motor reaction time *MS*	Motor reaction time *F*	Total reaction time *MS*	Total reaction time *F*
Between subjects	43								
A (manifest anxiety)	1	.005	NS	.021	.88	.186	4.54*	.041	1.05
Subj. w. groups	42	.184		.024		.041		.039	
Within subjects	352								
B (practice)	8	.141	3.52[b]	.022	22.00[b]**	.014	7.00[b]*	.037	37.00[b]**
A × B	8	.053	1.32[b]	.001	1.00[b]	.002	1.00[b]	.002	2.00[b]
B × Subj. w. groups	336	.040		.001		.002		.001	

[a] Log transformation.
[b] Conservative *F* test with $df = 1, 42$.
* $p < .05$.
** $p < .01$.

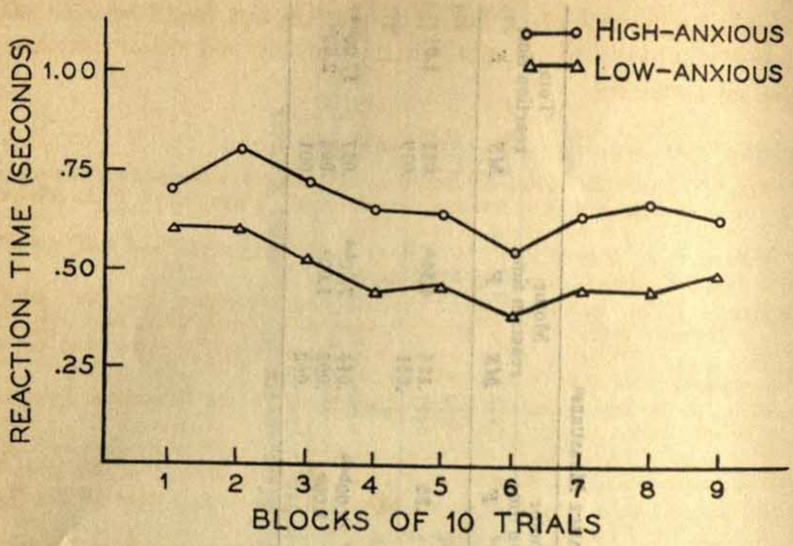

FIGURE 1
MOTOR REACTION TIME FOR HIGH- AND LOW-ANXIOUS SUBJECTS AS A FUNCTION OF BLOCKS OF TRIALS

total reaction time than did the sample of high-anxious *S*s, the difference was not statistically significant. This could be due to the high-anxious *S*s' shorter mean premotor reaction time, which obscured differences between the groups when the premotor and motor reaction times were combined to obtain the total reaction time. It is hypothesized that failure to distinguish between the premotor and motor components of reaction time may have been responsible for the negative results obtained in previous investigations by Allen (1), Farber and Spence (2), and Noble and Hays (6) relating manifest anxiety and performance of a complex reaction time task.

E. SUMMARY

The effects of manifest anxiety and practice on performance of a complex reaction time task were investigated in the present experiment. Twenty-two low-anxious and 22 high-anxious *S*s were required to press a switch in response to a pattern of lights arranged in a 3 × 3 matrix. Dependent variables were number of errors, premotor reaction time, motor reaction time, and total reaction time.

The performance of low-anxious *S*s was superior to that of high-anxious *S*s for motor reaction time only. All of the reaction time measures exhibited

a significant practice effect, but no interaction was found between manifest anxiety and blocks of practice trials. Premotor and motor reaction times were not correlated.

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TRUSTFULNESS AND SUSPICIOUSNESS AS A FUNCTION OF LIBERAL OR CONSERVATIVE CHURCH MEMBERSHIP: A FIELD EXPERIMENT*[1]

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A. INTRODUCTION

Empirical evidence and anecdotal reports indicate that there are significant differences in the personality structures and belief systems of members of various Protestant groups (3, 4). Some Protestant churches emphasize religious orthodoxy and self-denial and support rigid responses to "unacceptable" conduct and thoughts. These church groups are usually labeled "conservative." In contrast, "liberal" churches are much less rigid and much more tolerant of "unacceptable" thoughts and conduct.

Dynamic theories of personality posit that the rigid individual, repressing and denying his own unacceptable urges, projects them instead onto others. In the course of another study (1), we formed the impression that people attending conservative churches were more apt to lock their cars than were persons attending liberal churches. This observation, if empirically verified, would be consistent with a "projection hypothesis," so it was tested with an actual count of locked cars during church services.

B. METHOD

A theologian who was personally acquainted with the churches in a medium-size midwestern city selected the 10 most liberal and the 10 most conservative churches from the 111 Protestant churches located in the city. The liberal and conservative churches selected represented denominations that score low and high, respectively, on Glock and Stark's index of orthodoxy (2). Small churches with no parking lots and those in areas generally known as "rough" or "crime-ridden" were eliminated, leaving five liberal and five conservative churches for the study. This resulted in a nearly homogenous sample of churches in middle-class, predominately or exclusively white, residential neighborhoods.

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[1] We thank William Bodamer and Timothy Settles for their assistance.

During the main Sunday morning service, the total number of cars, their ages, and the number having the driver's door locked were determined.

C. RESULTS

Of the 348 cars in the lots of liberal churches 33 percent were locked, compared with 41 percent of the 450 cars in the lots of conservative churches. This difference is significant ($\chi^2 = 5.64$, $df = 1$, $p < .02$), confirms our unsystematic observations, and is consistent with the projection hypothesis.

A new car is more likely to be stolen or burglarized than an older one, and it seems reasonable that people would be more likely to lock newer cars. Consequently, it is possible that our results simply reflect the fact that members of conservative churches own newer cars. This possibility was tested by comparing the ages of the cars found in the church lots. It was found that 17 percent of the cars parked at liberal churches were six or more years old, while 27 percent of the cars parked at conservative churches were this old ($\chi^2 = 11.54$, $df = 1$, $p < .005$).

D. DISCUSSION

Results indicate that members of conservative churches are more likely to lock their cars than are members of liberal churches even though their cars are older and hence have a lower risk of theft or burglary. This finding is entirely consistent with a projection hypothesis that states that conservative church members, repressing their own unacceptable urges, project them onto others.

The present study supports the assertion by Webb *et al.* (5) that even highly complex sociological and psychological variables are amenable to study by unobtrusive field methods. Behavioristic field methods can complement the more exhaustive, but far more costly and inconvenient, survey method usually applied in field research.

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CREATIVITY AS A FUNCTION OF FIELD INDEPENDENCE AND DOGMATISM*[1]

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A. INTRODUCTION

In recent years, considerable attention has been paid to the study of stylistic dimensions of cognitive tasks. These dimensions are conceived as cognitive styles that characterize a person's manner of perceiving, thinking, and problem solving. Witkin (10) and his colleagues describe a dimension that they call field independence. This variable differentiates *S*s in terms of their active striving, analytic attitude, and degree of self-awareness. Rokeach (9) describes another dimension of cognitive style which is related to a person's openness to new ideas. Among other things, dogmatic *S*s have been found to possess poorer problem-solving ability when the problems to be solved require the ability to synthesize rather than analyze. The present study explored the role that field independence and dogmatism play in the performance of a task that presumably reflects creative ability.

Dogmatism and field independence have both been nominated as important constructs in relation to creativity. Interestingly, measures of dogmatism and field independence share little variance with each other and display very low correlations with measures that purportedly assess creativity or that at least reflect a predisposition towards creativity. Clearly the views of those who define creativity in terms of a relative isomorphism between "creativity" and such constructs as dogmatism and/or field independence are overly simplistic.

A comprehensive review of the literature concerning the relationship of field independence, dogmatism, and creativity led Bloomberg (1) to conclude that creative individuals are likely to be field independent, but not all field independent *S*s are creative. Put in another way, field independence is a necessary but not sufficient condition for creativity. Dogmatism, which reflects synthetic process abilities, is seen as a complementary and essentially uncorrelated dimension relative to field independence which, in part at least,

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reflects analytic process abilities. Since field independence and dogmatism are essentially uncorrelated, it is possible to identify *S*s representing combinations of levels on both of these constructs (i.e., above the median on both; above the median on one and not on the other; and so forth). *S*s identified as field independent and low dogmatic would seem to have implicit in their makeup two necessary abilities prerequisite to creative performance. Put in another way, both analytic and synthetic processes are required for creative performance.

In contrast to the foregoing, several studies employing the same paradigm have found that it is the high dogmatic-field dependent group that tends to be different from the other three defined groups. The high dogmatic-field dependent subject has been found to have unusual difficulty with both reversal and nonreversal shift concept formation problems (6) and scores low on inventory scales predictive of surgency or dynamism of classroom teaching behavior (7, 8). The present study tests two alternative hypotheses. The rational analysis of Bloomberg (1) suggests the hypothesis that field independent-low dogmatic groups are unusually creative. Juxtaposed with this hypothesis is that generated from previous empirical work; to wit, it is the field dependent-high dogmatic group that is likely to be *lower* in creativity.

B. Method

Seventy-four *S*s were administered the Hidden Figures Test (HFT), a measure of field independence (3); the Dogmatism Scale (DS), a measure of open-mindedness or dogmatism (9); and the Remote Associates Test (RAT), a measure of creativity (5). Mednick (4) has elaborated upon a theory involving the associative basis of the creative process. Essentially, the theory holds that creative subjects have flat associative hierarchies. Garskof and Houston (2) found this to be the case when high RAT scorers (median split) were compared with low RAT scorers. For the present data, separate analyses were undertaken for the male and female *S*s. Median splits on the DS and HFT identified four groups of *S*s for each sex group.

C. Results

Table 1 presents the means and standard deviations on the RAT for each of the groups. An inspection of Table 1 suggests that the mean RAT scores for the female groups are more homogeneous than those for the male groups. Further, for the male groups, it is the alternate hypothesis that the High Dogmatic-Low Hidden Figures Test (HD-LHFT) group will be less creative, rather than the hypothesis suggested by the Bloomberg (1) analysis,

TABLE 1

Means and Standard Deviations for Remote Associates Test (RAT) Scores

Group	Male $\overline{X}$	Male S	Male N	Female $\overline{X}$	Female S	Female N
HD-LHFT	15.2	5.2	10	17.5	7.1	10
HD-HHFT	19.3	3.5	10	18.1	4.4	7
LD-LHFT	19.7	3.6	10	18.1	5.1	7
LD-HHFT	18.9	6.0	10	19.2	5.3	10

that seems best supported by the data. For a formal evaluation of these impressions, the male and female data were subjected to separate 2 × 2 analyses of variance. Since the female cells had unequal *N*s, the data were analyzed by use of an unweighted means analysis, whereas the male data were analyzed by means of a regular analysis of variance. For females, none of the main effects or interactions approached even nominal significance levels ($p < .10$).

For males, the main effects of dogmatism and field independence yielded nonsignificant F ratios with the interaction reaching a marginal level of significance ($F = 2.86$; $df = 1.36$; $p < .10$). The form of the interaction was consistent with previous empirical work where creativity was not the criterion. That is, highly dogmatic, field dependent groups had a lower mean than other groups as defined. An orthogonal contrast comparing the HD-LHFT group with the pooled data for the groups was significant ($t = 2.43$; $df = 36$; $p < .05$). The form of interaction does not support the Bloomberg (1) rationale, which would predict a significant interaction with the Low Dogmatic-High Hidden Figures Test (LD-HHFT) group expected to display unusually superior performance. The lack of any significant results for females is consistent with the rather common finding that field independence is a more potent or salient variable for males than for females.

The present study provides weak support for the notion that field independence and dogmatism, when considered in concert, provide some information concerning creativity. Of course, the test used to measure creative disposition is limited. Presently other studies are under way that expand the criterion set (i.e., sample divergent thinking tasks) and more directly assess the slopes of the associative networks produced by *S*s, which should clarify the results reported here.

D. SUMMARY

This paper examines the theoretical relationship among field independence, dogmatism, and creativity. Data are presented that test the hypothesis that field independent, open-minded individuals are unusually creative. The im-

plications of the study are that when taken separately, neither field independence nor dogmatism are useful in explaining variation on a task presumed to reflect creative potential, whereas when considered together, the explanatory power of these variables is enhanced.

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MATERNAL CHILD REARING ATTITUDES IN HUTTERITE COMMUNAL SOCIETY* [1]

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A. INTRODUCTION

In a paper describing the Hutterite paternal attitudes toward child rearing, Schludermann and Schludermann (9) suggested that Hutterite fathers tended to think in highly authoritarian styles. The Hutterite fathers expressed attitudes approving strict discipline for children and male dominance in family relationships. The paternal attitudes were in line with the highly patriarchal power structure of Hutterite society.

In this study the investigators attempted to study the attitudes toward child rearing of Hutterite mothers. In order to see the results of this study in proper perspective, some background information about the role of the Hutterite mother will be helpful. In a previous paper Schludermann and Schludermann (9) outlined basic Hutterite values. They also pointed out that Hutterites regard systematic indoctrination of Hutterite children in Hutterite values as essential for the survival of the Hutterite way of life. The child rearing functions of parents are supplemented by colony institutions, such as the kindergarten, German school, Sunday school, baptism classes, etc. In this paper some additional information will be provided which pertains more particularly to the Hutterite mother's role. The role of the Hutterite woman is very rigidly defined as that of housewife and mother. Even spinsters and married women without children tend to assume maternal roles by "adopting" specific children and by assuming special responsibility for them. The woman's role is also to be subservient to male authority within the colony. Women are excluded from any major decision making. They must be plainly dressed, though neatly apparelled. An unmarried woman has little alternative but to help other women and their children. It is no exaggeration

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to say that the maternal role (in all its ramifications) is the only role available to Hutterite women.

The role of the Hutterite mother differs in many important aspects from that of women in the outside society. Once a woman is married, she is expected to bear children throughout her childbearing age. No birth control or family planning is allowed. It is therefore not unusual to see families of more than 10 children, nor is it unusual for women in their 40's to have some very young children while their older children are already married with children of their own. The communal social system of Hutterite society involves several features that ease considerably the woman's burden of having to take care of a large family. During pregnancy the mother makes use of the best medical facilities available in nearby towns. Babies are born in hospitals. After returning from the hospital, the mother is given a six weeks' rest. Other colony women take care of her household duties and look after the baby. Thereafter, the infant spends a considerable part of each day under the care of teen-age girls appointed as baby sitters. After the age of two the child goes to kindergarten and spends most of the day under the supervision of grandmothers appointed as kindergarten teachers. During the school years children and adolescents spend a good part of the after school hours under the supervision of the German teacher. The mother does not spend much time shopping and cooking for the family because meals are prepared in the communal kitchen and eaten in the communal dining room. Because of the above-mentioned laborsaving arrangements, a Hutterite mother of a large family need not feel shut-in, but has ample time to assume responsibilities outside of the house (e.g., working in kitchen and garden) and to pay social visits to other women. The introduction of laborsaving household appliances (e.g., washing and drying machines, electric mixers, stoves and oven, walk-in freezers, dishwashers, etc.) has increased considerably the amount of leisure time available to Hutterite women. (Because of the large amount of leisure time, Hutterite mothers were more available for data collection than were the Hutterite fathers.) Finally, it should be pointed out that having many children does not create a financial burden for the Hutterite family. Hutterite colonies assume all financial responsibilities for their members, and large families obtain large living quarters and sufficient clothing, etc. Thus, in comparison with mothers from urban Western society, it is much less stressful for a Hutterite woman to be the mother of a large family.

According to Hostetler (4) all colony roles are psychologically marked by strong elements of dependency and especially so for women. A woman who cannot accept the rigidly defined female and mother roles has no other alternatives to abide in the colony. Consequently, women must learn to accept the traditional roles of a housewife and mother. The objectives of this research were twofold. Firstly, an attempt was made to describe the Hutterite mothers' attitudes towards child rearing and thereby to discover the basic attitudinal dimensions. If the existence of a Hutterite woman in the colony depends on how well she has accepted and internalized the given value systems of the society and her role in it, then one may expect agreement between a mother's attitudes towards child rearing and the society's expectations from a mother. Secondly, the purpose was to investigate the stability of attitudes toward child rearing across two generations of Hutterite mothers. If the Hutterite society must struggle for its survival and continuity of its traditional values and styles of life, then it is essential that each succeeding generation of young mothers must accept and propagate the same attitudes as inculcated from the older mothers. In other words, there must not be any significant change, but only continued stability across time and generations.

B. METHOD

1. *Subjects*

Seventy-nine Hutterite mothers ranging in age from 21 to 78 years participated in the study. The mothers came from some 20 different colonies of rural Manitoba. The sample was subdivided into 45 young mothers (21 years to 44 years) and 34 old mothers (45 years to 78 years). The latter group consisted of *Ss* who were not only mothers but also grandmothers.

Mothers in the Hutterite colonies were contacted individually. The purpose of the study was explained to them, and they were asked to cooperate by filling out the questionnaire. The mothers could either read the questionnaire and check off the answers, or they could respond verbally to questions that were read to them.

2. *The Instrument and the Procedure*

Maternal attitudes were assessed by means of a modified version of the Mother's Form of the Parental Attitude Research Instrument (Mother's PARI). Schaefer (6) developed the Mother's PARI as a Likert-type questionnaire designed to elicit mothers' attitudes toward child rearing. Zuckerman (10) developed a reversed form of the PARI, where each item of Schaefer's (6) PARI was restated in negative terms. If a subject were logically consistent, agreement with an item of the original questionnaire implied disagreement with the corresponding item of the reversed questionnaire. Methodological studies by Schaefer (7), Zuckerman *et al.* (11), and Schludermann and Schludermann (8) have demonstrated the reliability and factorial validity of the PARI.

In order to assess and control for the acquiescence response set among respondents, the investigators developed a questionnaire by selecting scales from Schaefer's (6) unreversed version and from Zuckerman's (10) reversed version. There were 10 unreversed scales: Encouraging Verbalization, Seclusion of the Mother, Fear of Harming the Baby, Suppression of Aggression, Equalitarianism, Approval of Activity, Inconsiderateness of the Husband, Ascendancy of the Mother, Comradeship and Sharing, and Dependency of the Mother. There were 13 reversed scales: Fostering Dependency, Breaking the Will, Martyrdom, Marital Conflict, Strictness, Irritability, Excluding Outside Influences, Deification, Rejection of the Homemaking Role, Avoidance of Communication, Suppression of Sexuality, Intrusiveness, and Acceleration of Development. In order to assess the strength of acquiescence sets, three unreversed scales were added to the above: Breaking the Will, Irritability, and Deification. These three unreversed scales duplicated the three reversed scales of the same name.

Each of the 26 scales of the modified Mother's PARI was composed of five items. The items were statements expressing maternal attitudes, and the subject was asked to decide whether she A) strongly agreed, a) agreed, d) disagreed, or D) strongly disagreed with the stated attitude. For unreversed items the following scoring system was used: A) strongly agree = 4; a) agree = 3; d) disagree = 2; D) strongly disagree = 1. For reversed items the following scoring system was used: A) strongly agree = 1; a) agree = 2; d) disagree = 3; D) strongly disagree = 4. The scale score was calculated by summing up the scores of the five items that composed that scale.

C. RESULTS

1. *Factor Structure*

A factor analysis was performed on the 23 × 23 correlation matrix of the first 23 scales. Factoring was done by the principal axes method, and the resulting factors were rotated orthogonally according to the Varimax criterion. An eigenvalue of 2.0 was used as the criterion for rotation of factors. Three common factors emerged which accounted for 41.6 percent of the variance before rotation. The Varimax factors reflected closely the information of the correlation matrix in the sense that scales with significant loadings (greater than ±.40) on a given factor tended to form a distinct cluster of moderately high (i.e., between ±.30 and ±.50) intercorrelations.

Factors are described here in terms of those scales that have significant loadings on that factor.

$F_{A\text{-}D}$: There were nine scales that described this factor. Seven of these had positive loadings, as follows: Seclusion of the Mother, Fear of Harming the Baby, Suppression of Aggression, Approval of Activity, Inconsiderateness of Husband, Ascendancy of the Mother, and Dependency of the Mother. The remaining two scales had negative loadings on this factor: Fostering Dependency and Rejection of the Homemaking Role. The scales on this bipolar factor described basically an approval-disapproval dimension of the traditional mother's role in child rearing. Therefore, the bipolar factor was labelled the Approval-Disapproval Factor.

F_{DO}: Seven scales described this factor. Three of these scales had positive loadings: Encouraging Verbalization, Equalitarianism, and Comradeship and Sharing. The remaining four scales had negative loadings and represented the opposite of Breaking the Will, Strictness, Excluding Outside Influences, and Avoidance of Communications. The scales describing this bipolar factor

TABLE 1

VARIMAX FACTOR STRUCTURE OF HUTTERITE MOTHER'S PARI

SCALES	$F_{A\text{-}D}$	F_{DO}	F_{MO}
1. Encouraging Verbalization	.04	.72	.12
2. Fostering Dependency (R)*	—.61	—.08	—.12
3. Seclusion of the Mother	.48	—.03	—.12
4. Breaking the Will (R)	.13	—.59	—.07
5. Martyrdom (R)	—.38	.14	.06
6. Fear of Harming the Baby	.53	.25	—.05
7. Marital Conflict (R)	—.23	—.07	.69
8. Strictness (R)	—.11	—.58	—.06
9. Irritability (R)	—.01	.00	.68
10. Excluding Outside Influences (R)	—.05	—.73	.02
11. Deification (R)	—.09	—.11	—.37
12. Suppression of Aggression	.54	—.19	—.38
13. Rejection of the Homemaking Role (R)	—.45	.09	.52
14. Equalitarianism	.11	.71	.13
15. Approval of Activity	.73	—.07	—.27
16. Avoidance of Communication (R)	—.35	—.40	[illegible]
17. Inconsiderateness of the Husband	.54	.16	[illegible]
18. Suppression of Sexuality (R)	—.29	—.27	[illegible]
19. Ascendancy of the Mother	.63	.12	[illegible]
20. Intrusiveness (R)	—.33	—.33	[illegible]
21. Comradeship and Sharing	—.10	.55	[illegible]
22. Acceleration of Development (R)	—.35	—.09	[illegible]
23. Dependency of the Mother	.47	.34	[illegible]

* Scales labelled R were taken from Zuckerman's reversed questionnaire (10 other scales were taken from Schaefer's unreversed questionnaire (6).

represented a democratic orientation toward child rearing and interpersonal relations. Therefore, this factor was called the Democratic Orientation Factor.

F_{MC}: This factor was described by seven scales. Five of these scales had positive loadings: Marital Conflict, Irritability, Rejection of the Homemaking Role, Avoidance of Communication, and Acceleration of Development. The remaining two scales had negative loadings and represented the opposite of Suppression of Sexuality, and Comradeship and Sharing. These scales tended to focus on the Hutterite mothers' concern about the relationship between marriage partners as an important dimension in child rearing. Consequently this factor was labelled the Marital Conflict Factor.

2. *Comparison of Young and Old Mothers*

Table 2 reports the means and standard deviations of the scale scores of young and old mothers. A *t* test of independent means was used to test the significance of mean scale scores between young and old mothers.

The results showed that out of the first 23 scale scores only four scales showed significant differences ($p < .05$ to .001) between young and old mothers. It is interesting to note that the four significant differences were observed only among the unreversed scales. The three unreversed scales that were added to duplicate the reversed scales (i.e., scales 24 to 26) also showed significant ($p < .05$ to .001) mean differences between age groups. In these three scales the older mothers showed a greater acquiescence set than the young mothers. Thus far in seven scales—i.e., 6, 14, 19, 23, and 24 to 26—the older mothers tended to show a stronger tendency to agree with positive statements than did the younger mothers. The investigators suggest that the significant mean differences between young and old mothers could be accounted for to a considerable degree by a stronger acquiescence set among the old Hutterite *S*s than among the young *S*s. It is interesting to note in this context that Zuckerman (11) had pointed out that the unreversed PARI items were more likely to elicit acquiescent response biases than reversed items. The investigators therefore concluded that, if one allows for a greater acquiescence set among older women, young and old Hutterite mothers had similar attitudes toward child rearing.

Both young and old mothers tended to favor strongly Seclusion of the Mother, Fear of Harming the Baby, Strictness, Suppression of Aggression, Equalitarianism, Approval of Activity, Inconsiderateness of Husband, and Comradeship and Sharing. On the other hand they tended to disapprove strongly of Marital Conflict, Rejection of the Homemaking Role, and Avoid-

TABLE 2
HUTTERITE MOTHER'S PARI: *t* TEST COMPARING MEAN SCALE SCORES OF YOUNG AND OLD MOTHERS

SCALES	Young mothers *X*	*SD*	Old mothers *X*	*SD*	Y *vs* O *t* test
1. Encouraging Verbalization	13.6	3.6	13.7	3.4	—0.15
2. Fostering Dependency (R)[a]	11.2	3.0	10.0	3.4	1.59
3. Seclusion of the Mother	15.7	2.7	16.9	3.1	—1.84
4. Breaking the Will (R)	13.2	2.8	12.2	2.9	1.64
5. Martyrdom (R)	10.8	2.3	10.9	2.7	—0.20
6. Fear of Harming the Baby	14.4	3.3	15.9	2.7	—2.19*
7. Marital Conflict (R)	8.4	3.4	7.6	2.7	1.16
8. Strictness (R)	15.8	3.2	14.7	4.1	1.30
9. Irritability (R)	10.8	2.7	11.0	2.5	—0.30
10. Excluding Outside Influences (R)	10.8	3.4	10.4	3.1	0.49
11. Deification (R)	13.2	2.6	12.8	2.3	0.83
12. Suppression of Aggression	16.4	3.3	17.1	2.8	—0.93
13. Rejection of the Homemaking Role (R)	8.1	2.3	7.6	2.5	0.79
14. Equalitarianism	14.3	2.5	15.5	2.7	—2.04*
15. Approval of Activity	16.7	2.6	17.6	2.5	—1.48
16. Avoidance of Communication (R)	6.9	2.4	6.9	2.3	0.03
17. Inconsiderateness of the Husband	14.9	3.6	15.8	2.9	—1.17
18. Suppression of Sexuality (R)	14.7	3.1	14.8	3.3	—0.11
19. Ascendancy of the Mother	13.0	3.0	15.9	3.0	—4.29***
20. Intrusiveness (R)	12.5	3.8	12.4	3.0	0.18
21. Comradeship and Sharing	17.4	1.9	16.9	2.8	0.86
22. Acceleration of Development (R)	10.7	2.9	10.9	3.1	—0.17
23. Dependency of the Mother	13.6	3.5	15.9	2.8	—3.25**
24. Breaking the Will (see Scale 4)[b]	15.3	3.6	17.3	2.9	—2.66*
25. Deification (see Scale 11)[b]	16.3	3.8	18.7	2.1	—3.63***
26. Irritability (see Scale 9)[b]	11.9	4.3	14.0	4.1	—2.19*

[a] See footnote for Table 1.
[b] These three unreversed scales duplicate reversed scales in the questionnaire.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

ance of Communications. The pattern of approval and disapproval suggested that the parental attitudes of Hutterite mothers were in agreement with the official value system of Hutterite society.

D. DISCUSSION

The first objective of this study was to find the basic dimensions that described the child rearing attitudes of Hutterite mothers. Factor analysis revealed three dimensions along which Hutterite mothers differed from each other in child rearing attitudes: the Approval-Disapproval Factor, the Democratic Orientation Factor, and the Marital Conflict Factor. In other words, the maternal attitudes of a given Hutterite woman could be described meaningfully in terms of the degree to which she approved or disapproved of her maternal role, the degree to which she showed a democratic orientation toward child rearing, and the degree to which she approved or disapproved of marital conflict.

On the substantive level, the results suggested that there was no major discrepancy between the maternal attitudes of Hutterite women and the maternal role assigned to them by Hutterite society. In other words, Hutterite mothers had internalized the role that their society assigned to them. They tended to approve of situations where the mother is secluded or dependent. On the other hand, they tended to disapprove of attitudes encouraging mothers to fight for their rights and to reject the homemaking role. Compared with Hutterite fathers (9), Hutterite mothers tended to have less authoritarian and more democratic attitudes toward parent-child relationships. It is interesting to note that studies in other societies tend to show similar differences between paternal and maternal attitudes or behavior: males tended to be more authoritarian and females tended to be more democratic in their attitudes (e.g., 1, 2, 3, 5).

The results of this study suggested that maternal attitudes tended to be highly stable across generations of Hutterite mothers. This stability suggests that the Hutterian society is capable of effectively transmitting values and attitudes from one generation to the next. The high effectiveness of Hutterian socialization practices may be regarded as a precondition for the continuity of Hutterite traditional values and the survival of the Hutterian way of life.

E. SUMMARY

Seventy-nine Hutterite mothers ranging in age from 21 years to 78 years completed a Mother's Form of the PARI. Factor analysis of the data suggested that the maternal attitudes of Hutterite mothers could be described meaningfully in terms of three independent dimensions, which were labelled as the Approval-Disapproval Factor, the Democratic Orientation Factor, and the Marital Conflict Factor. The data of the young mothers (21-44 years) and of the old mothers (45-78 years) were analyzed separately. Comparisons of the mean scale scores suggested that both young and old mothers tended to accept traditional Hutterite values. There were few differences in parental attitudes between young and old mothers.

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A SEMANTIC DIFFERENTIAL STUDY OF THE MEANING OF PERSONALITY TEST ITEMS TO CHILDREN FROM DIFFERENT SOCIOECONOMIC GROUPS*

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A. INTRODUCTION

The "fact" that members of different socioeconomic status (SES) groups exhibit consistent personality differences is presumably well supported by numerous studies (1, 2, 4, 6, 7, 9, 10, 11, 12, 15). Typically, these investigators of group differences administer a personality test to members of different SES groups and compare the results across groups. Statistically significant differences are usually attributed to differing personality traits between the two groups.

Such research into the nature of personality differences across SES lines may suffer from an important weakness in the implicit assumption upon which it is based. Some investigators assume that personality test items mean the same things to all readers or, if this not be the case, that any differences in meaning of test items is due to interpretation determined by the individual's personality. It is possible that this assumption is ill founded. Rather than exposing underlying personality traits, test items may reflect no more than a particular learning situation exclusive to one or more groups. Alternative interpretation of personality test items may be a reflection of the different experiences to which SES groups are exposed.

In other words, the concepts underlying any test item may mean different things to members of different groups. It is the purpose of this study to investigate whether or not there are consistent differences in interpretation of these concepts across two SES levels. More specifically, this study was designed to investigate the possibility that concepts derived from personality test items may mean different things to members of different SES groups.

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B. Method

1. *Subjects*

Two groups of *S*s, a low and a high SES sample, were selected for this study. The low SES sample was comprised of 90 students, 45 males and 45 females, in five classes drawn randomly from the fifth grade classes of an inner city school.

The high SES sample consisted of 117 students, 66 boys and 51 girls, in five classes drawn randomly from all fifth grade classes in a wealthy suburban school district.

2. *Measuring Instrument*

The measuring instrument consisted of 24 concepts to be rated on 12 bipolar-adjectival scales. The semantic differential (SD) rating technique described by Osgood, Suci, and Tannenbaum (14) was employed. The concepts to be rated were derived by the investigator from 24 randomly selected items from the *California Test of Personality, 1953 Revision, Elementary Form AA*—called the CTP (17).

The CTP consists of 12 subtests purporting to measure personal and social adjustment. Twelve items are included in each subtest. For purposes of this study all items in each subtest were listed numerically, and two items were selected at random from each subtest. Each item was then converted by the investigator from its original question form to a statement. These statements were designed to include as much of the original question as possible and were defined as the stimulus concepts to be rated by the *S*s. For example, the concept for Item No. 3 of the CTP ("Do you help other boys and girls have a good time at parties?") became "Helping other boys and girls have a good time at parties." The 24 concepts rated in this study are presented in Table 3, which can be found in the Results section.

Each concept was placed at the top of a separate sheet in the test booklet. Below each concept were placed 12 adjectival rating scales. These scales were selected because of their heavy loading on the three factors identified by Osgood (14) in his early work with the SD. These factors were the Evaluative factor (good-bad, beautiful-ugly, clean-dirty, and fair-unfair); the Potency factor (hard-soft, heavy-light, strong-weak, and large-small); and the Activity factor (moving-still, fast-slow, sharp-dull, and hot-cold). The scales were constructed following the procedures outlined by Osgood, Suci, and Tannenbaum, and, as suggested for use with children, each scale had five positions in which the *S* could respond.

In order to reduce the confounding effect of differences in the children's ability to read, the following procedure was adopted. After *E* read the instructions to the children, he read the concept on the first page of the test booklet. Each rating scale was read to the *S*s in question form: e.g., "Do you think that helping other boys and girls have a good time at parties is good or bad?" All concepts were read to the *S*s, and the individual rating scales were repeated for each concept although the question format was dropped after the ratings on the first concept were complete.

Other instructions used with the SD rating instrument were modeled after those suggested by Osgood *et al.* (14).

It should be recognized that this study was based on an important assumption. It was assumed that members of different SES classes did not respond differently to the SD technique itself and that measured differences reflected different perceptions of the meaning of the concept, not different reactions to the testing instrument. While the factor analyses would reflect some between-group differences (these analyses were sensitive to the intercorrelations between scales on the rating instrument), they could not indicate such things as a response set within the scales comprising the Evaluative dimension.

3. *Analysis of Data*

The *S*'s scores on each concept were determined by assignment of a numerical value to each alternative in the SD scale. The numerical scores were then used in the following analyses:

1. Two factor analyses were conducted, one for each of the two SES groups.[2] The function of these factor analyses was to determine the dimensions of semantic space for the two SES groups. They were intended to provide information on (*a*) the dimensions that define the semantic space of each socioeconomic group, and (*b*) the generality of the semantic space of the two groups' ratings of these concepts. For these analyses the investigator obtained a matrix of intercorrelations between scales. By summing over both *S*s and concepts, two 12 × 12 matrices of intercorrelations of each scale with every other scale were generated (one matrix for each SES group). Each matrix then served as the datum for a principal axis factor analysis (19). Each factor matrix was rotated by use of the varimax (8) criterion.

2. The unweighted means and standard deviations of the distribution of

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[2] The function of these factor analyses was similar to some of Osgood's analytic work on the semantic differential. The method that was used to generate the matrices of intercorrelations, as well as the description that follows, was directly patterned after Osgood's work (14).

scores on each factor were obtained for each concept and for each group. Each *S*'s score on each factor was computed by averaging his scores on the scales found to be most heavily weighted on each factor. The same sets of scales were used to define each factor for the two SES groups.

3. Three multiple discriminant analyses were conducted, one for each of the factors identified in the factor analyses. The first multiple discriminant analysis used the unweighted average of *S*s' scores on the scales most heavily weighted on factor one. Average scores for *S*s in each of the SES groups on each of the concepts served as the data for these analyses. An *F* ratio associated with a *p* value equal to or less than .05 was established as the level of rejection for each hypothesis. Similar analyses were performed for each of the other factors identified in the factor analyses.

C. Results and Discussion

1. *The Factor Analyses*

Table 1 summarizes the results of the two factor analyses; i.e., it defines the semantic space of the two SES groups.

a. Factor one. The most heavily loaded scales in the first dimension of semantic space are the ones Osgood (14) identified as the Evaluative factor in his work with the SD. The primary difference between the two groups is the high loading given the sharp-dull and strong-weak scales by the low SES *S*s. Apparently the sharp-dull and strong-weak scales have an evaluative connotation to children from poor SES backgrounds.

TABLE 1
FACTOR LOADINGS OF ROTATED MATRICES FOR LOW AND HIGH SES GROUPS

	Rotated factor loadings					
	Factor 1		Factor 2		Factor 3	
Scale	Low SES	High SES	Low SES	High SES	Low SES	High SES
Fair-unfair	.843	.856	.068	.127	.114	.208
Beautiful-ugly	.819	.817	.135	.239	.116	.252
Clean-dirty	.817	.780	.147	.229	.128	.230
Good-bad	.812	.839	.085	.184	.127	.214
Sharp-dull	.650	.456	.322	.511	.092	.088
Strong-weak	.606	.412	.367	.623	.083	.051
Large-small	.057	.225	.739	.581	.113	.133
Fast-slow	.190	.055	.642	.749	.123	.214
Moving-still	.302	.114	.535	.668	.009	.179
Heavy-light	.104	.194	.091	.034	.825	.802
Hard-soft	.227	.231	.008	.106	.755	.755
Cold-hot	.123	.363	.419	.252	.071	.010
% of total variance	30.88	28.15	14.31	18.58	11.32	12.70

The evaluative loading given these two scales may be interpretable in terms of the society in which children from the low SES families live and the vocabulary that they use. To be "sharp" is to be alert or to be a good dresser—to be evaluated positively. Conversely, to be "dull" is to be bad—to be evaluated negatively. To be strong is good; it gives one the power to survive and dominate. To be weak is bad; it is to be taken advantage of, to be powerless, to be dominated.

For the purposes of the multiple discriminant analysis, a decision had to be made as to which scales would comprise the Evaluative factor for both groups. In order to permit between-group comparisons, the semantic space must be defined in identical terms for both SES groups. It was decided that the fair-unfair, beautiful-ugly, clean-dirty, and good-bad scales, heavily loaded by both SES groups, would define the Evaluative dimension.

As can be seen in Table 1, the Evaluative factor was the most salient factor for both SES groups.

b. Factor two. The second dimension in semantic space was not as easily identified. Two problems confounded its definition.

1. The most heavily loaded scales were not identical to those comprising any single factor identified by Osgood. This was surprising, since the scales were originally selected because of their loadings on Osgood's factors.

Two elements may be responsible for this finding. First, the semantic space of the children in this study may be different from that of the adult *S*s used in Osgood's work. DiVesta's (3) progressive differentiation hypothesis, for example, suggests that young children's linguistic structures consist of two important dimensions: Evaluation and Dynamism. In one study DiVesta found that students in the fifth grade began to differentiate between the potency and activity components of the previously undifferentiated Dynamism factor. The beginnings of such a differentiation were apparent in the current work.

Second, Osgood (13) found that the dimensions of semantic space are, at least in part, determined by the concepts being rated. It is possible that the concepts used in the current study influenced the configuration of the semantic space of the *S*s.

2. The semantic space of the two groups consisted of somewhat different elements. The low SES *S*'s second factor was comprised of the following heavily loaded scales: large-small, fast-slow, and moving-still. The high SES group's heavily loaded scales included these three plus strong-weak and sharp-dull. It was decided to eliminate the strong-weak and sharp-dull scales from consideration in the definition of the semantic space for the high SES group.

Reflection on the communality of meaning among these scales suggested that this factor was best labeled a "Dynamism" factor. These scales measured whether the *S*s perceived the concept as being large and fast-moving or small, slow, and still; i.e., the dynamic attributes of the concept. The structure of this factor was similar to the Dynamism factor identified by Small (16).

In terms of percentage of variance accounted for by this factor, the upper SES subjects (who thought less in evaluative terms than the other group) made greater use of the Dynamism factor. While factor two was still an important measure of meaning for the children in this study, it was far less important than factor one.

c. Factor three. Factor three was easily identified because only two scales (heavy-light and hard-soft) were heavily loaded in this dimension. Furthermore, the factor structure was similar for both SES groups. The investigator named this the "Physical Qualities" factor. This factor accounted for approximately the same percentage of variance in the ratings of both groups.

The results of these two factor analyses defined the semantic space for these children. If there was generality of the semantic space of the two SES groups, then the position of each *S* in this semantic space could be defined in terms of the *S*'s scores on the scales comprising the Evaluative, Dynamism, and Physical Qualities dimensions.

Tucker's (18) Coefficient of Congruence was utilized as a measure of factorial similarity for the two samples. The data for this analysis were the two rotated factor matrices, one matrix for each of the SES groups. The results are summarized in Table 2.

It concluded that, for the concepts rated in this study, the factors defining the dimensions of semantic space for the two groups of *S*s were congruent. Therefore, the unweighted means of *S*s' ratings of each concept could be plotted in the same space.

The mean ratings of all *S*s within each SES group for each of the 24 concepts are presented in Table 3. The possible values in this table range from one to five. Low values represent ratings that are Evaluatively negative (i.e., unfair, ugly, dirty, and bad), low on the Dynamism factor (small, slow, and still), and low on the Physical Qualities factor (light and soft). Three was

TABLE 2

COEFFICIENTS OF CONGRUENCE BETWEEN FACTORS FOR LOWER AND UPPER SES GROUPS

Variable	1	2	3
1	.962	.436	.376
2	.598	.947	.151
3	.473	.107	.908

TABLE 3
MEAN FACTOR SCORES FOR EACH CONCEPT

Concept	Mean factor scores					
	Factor 1		Factor 2		Factor 3	
	Low SES	High SES	Low SES	High SES	Low SES	High SES
Helping other boys and girls have a good time at parties	4.70	4.54	3.79	3.62	2.45	2.79
Usually believing what other boys and girls tell you	1.91	3.09	3.12	3.09	3.52	3.05
Classmates seeming to think you are not a good friend	2.17	1.71	2.88	2.97	3.30	3.77
Sometimes being cheated when you trade things	1.68	1.49	2.95	3.08	3.42	3.63
Feeling your folks boss you too much	2.83	2.18	3.16	3.13	3.33	3.74
Being prevented from doing most of the things you want to do	2.83	2.30	3.21	2.97	3.13	3.68
Members of your family being good to you	4.55	4.41	3.85	3.79	2.30	2.32
Having just a few friends	2.56	2.43	2.55	2.49	3.00	3.46
Friends or classmates often saying or doing things that hurt your feelings	1.61	1.49	2.81	2.72	3.53	3.89
People often being mean or unfair to you	1.77	1.56	2.92	2.77	3.27	3.93
Finding that you are not hungry at meal times	2.77	2.68	2.97	2.44	2.97	3.14
Often feeling sick to your stomach	2.07	1.83	2.86	2.70	3.26	3.85
Needing to obey your father or mother even when friends tell you not to	2.36	3.46	3.25	3.21	3.31	3.35
Children being nice to people they don't like	3.86	3.70	3.38	3.43	2.91	3.23
Letting people know you are right no matter what they say	3.64	3.12	3.30	3.16	3.01	3.44
Talking to people as soon as you meet them	3.96	3.75	3.28	3.32	2.79	2.84
Making friends or classmates do things they don't want to do	2.03	1.61	2.91	2.79	3.39	3.84
Needing something so much that it is all right to take it	2.14	1.85	3.12	3.01	3.28	3.42
Your folks thinking that you are just as good as they are	3.73	3.35	3.48	3.32	2.87	2.94
Being treated mean at home by your folks	2.06	1.70	3.00	2.70	3.32	3.85
Being liked by other boys and girls at school	4.30	4.62	3.61	4.03	2.63	2.35
Doing nice things for some of the older boys or girls	4.07	4.15	3.49	3.70	2.95	3.00
Visiting many of the interesting places near where you live	4.41	4.49	3.53	3.98	2.69	2.53
Trying to get your friends to obey the laws	4.25	4.40	3.65	3.65	2.97	3.44

defined as the midpoint of each scale, while five represented use of the high end of the scales (i.e., fair, beautiful, clean, good, large, fast, moving, heavy, and hard).

2. *Multiple Discriminant Analyses*

Table 4 summarizes the results of the three multiple discriminant analyses. The data for the first analysis were the unweighted average of the *S*s' scores on the four scales heavily weighted on the Evaluative factor (fair-unfair, beautiful-ugly, clean-dirty, and good-bad). The *S*s' mean score on each factor (sometimes referred to as a "factor score") for each concept served as the data for the multiple discriminant analyses. The three null hypotheses were "There is no difference between the unweighted mean scores of *S*s from the two SES groups on the (Evaluative, Dynamism, Physical Qualities) factor."

The results indicate differences in the ratings of the concepts by the two SES groups along all three dimensions of semantic space. Based on the assumption that these differences did not merely reflect different reactions to the testing instrument, the findings support the hypothesis that the personality test items had different connotative meanings for the lower and upper SES children.

The finding of between-group differences on the Evaluative dimension is of particular interest to psychologists concerned with personality measurement. One of the implications of this finding is related to the effect of a "social desirability" variable. We know, for example, that responses of children to personality measures are influenced to some degree by attempts by the test-taker to appear socially desirable. The current study suggests that early attempts to measure and control the "social desirability" of personality test items were naive. Some early investigators failed to recognize that personality test items vary in their social desirability, depending not only on factors internal to the item but also on the experiences of the test-taker. Edwards (5) was aware of this problem when he constructed the *Edwards Personal Preference Schedule* (EPPS). He noted that the EPPS items were matched on the social desirability dimension only for the specific group of subjects for which his test was intended; i.e., high school graduates with

TABLE 4
SUMMARY OF RESULTS OF THREE MULTIPLE DISCRIMINANT ANALYSES

Factor	F	df	p
Evaluative	9.148	23, 183	$<.001$
Dynamism	1.988	23, 183	$<.006$
Physical qualities	3.288	23, 183	$<.001$

some college experience. The current study supports Edwards' notion that items desirable to one group of subjects need not be desirable to another. It may be that the social desirability of two personality test items can be matched only for a particular group, and not necessarily for all groups. Unless the test-maker is willing to provide different forms of an instrument for different groups of subjects or compensate for these differences in some manner, attempts to control for social desirability may be unsuccessful.

D. Summary and Conclusions

A semantic differential rating technique was employed to determine if personality test items have different meanings to 207 fifth grade children from low and high SES groups. *S*s rated 24 concepts from the *California Test of Personality*. The data from each group were factor analyzed. Three factors were identified for both groups: the evaluative, dynamism, and physical qualities factors. *S*s' responses were compared by means of the multiple discriminant analysis technique. In all cases, between-group differences were found ($p < .01$).

This study served three functions. First, the results of the two factor analyses may offer some support for DiVesta's progressive differentiation hypothesis.

Second, it was found that, for the concepts rated in this study, the semantic space of the upper and lower SES groups could be defined in terms of the same three factors.

Finally, the results of this study suggest that the concepts derived from the CTP had different meanings to the two SES groups.

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THE EFFECTIVENESS OF TIME-OUT IN REDUCING MALADAPTIVE BEHAVIOR OF AUTISTIC AND RETARDED CHILDREN*

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A. INTRODUCTION

Over the last decade considerable work has been done using time-out from positive reinforcement as a technique for modifying behavior in both human and animal subjects. This technique, generally stated, first creates a situation in which the individual is rewarded for behavior within a clearly delineated situation. Whenever the individual emits an inappropriate behavior, predesignated as part of the experimental procedure, he is removed from the setting in which he has been previously rewarded. The response that leads to removal takes on negative reinforcing properties. In other words, behavior that leads to immediate removal from the setting is extinguished, resulting in the elimination of the undesirable or inappropriate behavior at least within the time-out setting. Leitenberg (6) gave a more specific definition. He stated that there is not a single set of operations that adequately defines time-out. However, the essential feature is a period of time when positive reinforcement is not available.

It has been shown that the time-out technique is effective in developing higher level social behaviors in less retarded and normal children. In two studies using kindergarten children, Baer (2, 3) reported that children would increase the rate of bar pressing in order to prevent the interruption of cartoons they were viewing. In the later study Baer eliminated thumb-sucking behavior by withdrawing positive reinforcement, again cartoons, whenever the child put his thumb into his mouth.

Although a sizable body of literature has been accumulated showing the effectiveness of time-out with children, psychiatric patients, and mentally retarded, very little can be found in using this procedure with the profoundly retarded or autistic, both of whom as a group display many common behavior patterns. Lovaas and his associates (7, 8, 9) have reported some success in modifying the behavior of autistic children by using such incentives as

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praise, criticism, food, and electric shock. The essential problem of generalizing behavioral patterns learned in therapy to everyday life situations, however, was never solved. Lovaas himself stated this concern in a 1967 paper (10, p. 186). "There are still serious restrictions about the extent of generalized imitations after one year of training. Furthermore, we are not certain about the extent the behaviors will be maintained without extrinsic reinforcement. Presumably, normal children's imitative behavior improves without the use of extrinsic (biological or shock) reinforcement."

The primary goal of the writers was to design a therapy for autistic and profoundly retarded children in an attempt to determine if they can actually develop new, more socially appropriate behavioral patterns within the time-out procedure. Secondary goals were to develop techniques designed to facilitate the generalization of this behavior, as well as to evaluate the feasibility of such programs when incorporated into the everyday programming of these children.

B. METHOD

1. *Subjects*

Four children participated in the study. Their mean *CA* at the start of the study was 10.77 years. Their mean tested *IQ* was 16.5. Of the four children, three of whom were tested by a modified version of the Cattell (5), it was felt that severe behavioral problems prohibited accurate evaluation. One of the children, Child A, diagnosed as suffering from tuberous sclerosis, was the only one considered to be profoundly retarded with no functional disorder. Child B was very destructive both to himself and others. One of the continuing medical problems with this child is to prevent infection of her self-inflicted injuries. The same problems of inappropriate aggressive behavior patterns toward herself and others were present in Child C, but to a slightly lesser degree. Although she was nonverbal, as were all of the girls in the study, she was able to pass successfully all of the nonverbal items on the Stanford Binet Intelligence Test (11) through the three-and-one-half year level. The fourth child in the study, Child D, was the youngest and most hyperactive, as well as being quite aggressive toward other children.

2. *Procedure*

The four children were selected by the three experimenters because they were rated the four worst behavioral problems in a living unit of 25 children. These children participated in a total of 120 therapy sessions, each lasting 15 minutes. The first 15 sessions were devoted to obtaining a base line response rate. During this period the children were placed in a circle in an activity room leading directly into the main living unit. The subjects were rewarded on a 60-1 variable interval schedule regardless of the behavior displayed by them. The first 15 sessions were important also because it was felt that during this time the stimulus situation of the circle and the simple activities participated in by the girls would begin to take on a positive valence, so that subsequent removal from this circle would be aversive.

Three specific behavioral patterns were designated as those that, if emitted, would lead to time-out (removal from the circle). These were physical aggression towards self, physical aggression towards others, and hyperactivity that led to running from the circle. Following the base line period, time-out training began. Whenever a girl did emit any of the behaviors that began a time-out period, she was removed from the circle for a varying period of time of not more than two minutes nor less than 10 seconds. She was not placed in a time-out room, but rather simply taken away from the group fully capable of viewing both the activities and the rewards administered to the other girls left in the circle.

The schedule of reinforcement was increased from 60-1 variable interval initially to 360-1 at the end of the study. When no inappropriate behavior occurred for three or four therapy sessions, it was felt that the children could continue behaving effectively with an increased ratio of reinforcement. The variable interval schedule was chosen and increased because behavior learned under this schedule is the most resistant to extinction.

After the 52nd therapy session, the group was moved from the small activity room to the regular living unit of the girls. The group was also doubled, with four other girls of similar ages and *IQ*s being added. These children did not receive reinforcement although they did participate in the games conducted by the activity worker. Both the move into the living unit and the addition of the four new girls were done in an attempt to facilitate generalization of the behaviors extinguished during the therapy sessions to the lives of the children in all other daily activities.

All four children participated in 120 therapy sessions. The entire project lasted 14 months, delays occurring three times for more than two weeks because of illness to one of the children. The reinforcers used throughout the project were M&Ms. It was obvious from the behavioral patterns of the children in therapy that these were both reliable and consistent motivators to all four girls.

C. RESULTS

The results of the study are presented graphically in Figures 1, 2, 3, and 4. Each graph represents the progress of one of the four children through 120

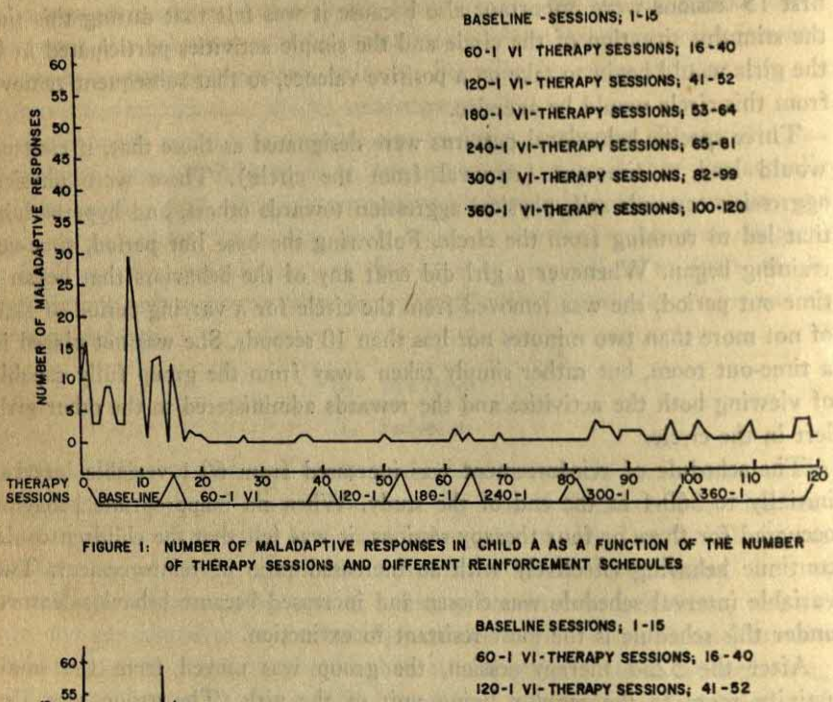

FIGURE 1: NUMBER OF MALADAPTIVE RESPONSES IN CHILD A AS A FUNCTION OF THE NUMBER OF THERAPY SESSIONS AND DIFFERENT REINFORCEMENT SCHEDULES

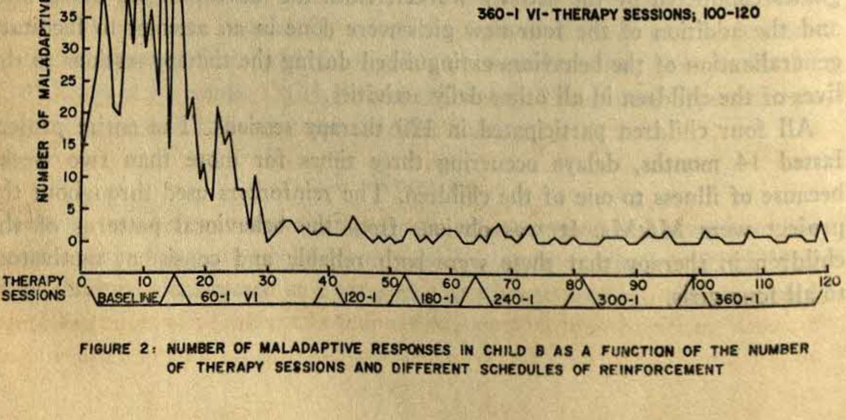

FIGURE 2: NUMBER OF MALADAPTIVE RESPONSES IN CHILD B AS A FUNCTION OF THE NUMBER OF THERAPY SESSIONS AND DIFFERENT SCHEDULES OF REINFORCEMENT

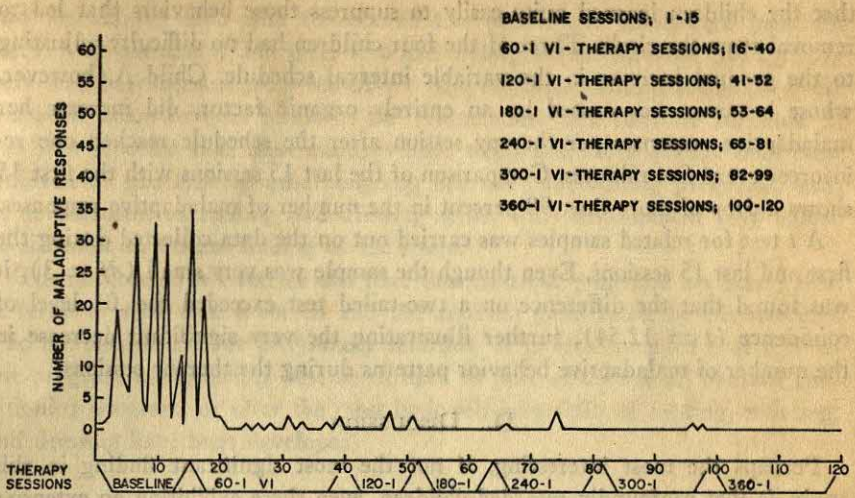

FIGURE 3: NUMBER OF MALADAPTIVE RESPONSES IN CHILD C AS A FUNCTION OF THE NUMBER OF THERAPY SESSIONS AND DIFFERENT SCHEDULES OF REINFORCEMENT

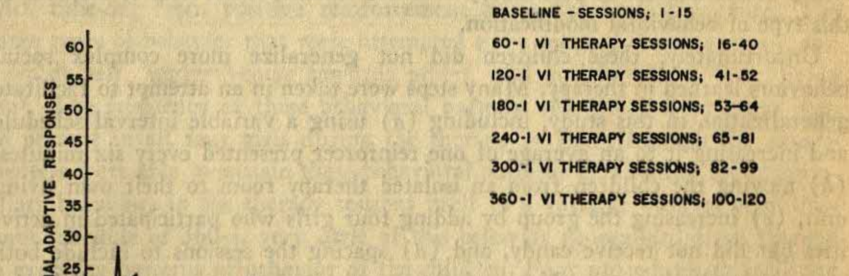

FIGURE 4: NUMBER OF MALADAPTIVE RESPONSES IN CHILD D AS A FUNCTION OF THE NUMBER OF THERAPY SESSIONS AND DIFFERENT REINFORCEMENT SCHEDULES

therapy sessions. The vertical axis shows the number of maladaptive responses for each session. As can be seen, the number of maladaptive responses dropped quickly for all children after the base line period was terminated. This indicated that the children learned quite easily to suppress those behaviors that led to removal from the circle. Three of the four children had no difficulty adjusting to the gradual increase in the variable interval schedule. Child A, however, whose behavior was caused by an entirely organic factor, did increase her maladaptive responses per therapy session after the schedule reached one reinforcer every five minutes. Comparison of the last 15 sessions with the first 15 shows a drop of more than 98 percent in the number of maladaptive responses.

A t test for related samples was carried out on the data collected during the first and last 15 sessions. Even though the sample was very small ($df = 3$), it was found that the difference on a two-tailed test exceeded the .01 level of confidence ($t = 12.54$), further illustrating the very significant decrease in the number of maladaptive behavior patterns during the therapy sessions.

D. Discussion

Perhaps the most interesting, if not the most significant finding in this study, is that profoundly retarded children, even those exhibiting an extensive amount of autistic behavior, are quite capable of learning in a time-out paradigm. In the review of the time-out literature, no studies were found in which either autistic or profoundly retarded children were able to respond to this type of behavioral modification.

Unfortunately, these children did not generalize more complex social behaviors learned in therapy. Many steps were taken in an attempt to facilitate generalization in this study, including (*a*) using a variable interval schedule and increasing it to an average of one reinforcer presented every six minutes, (*b*) moving the children from an isolated therapy room to their own living unit, (*c*) increasing the group by adding four girls who participated in activities but did not receive candy, and (*d*) spacing the sessions to include both morning and afternoon. None of these measures was successful. Behavior learned in therapy did not continue after the session was terminated. It is felt, then, that the results of this study are consistent with other behavioral modification projects that have worked with this type of child. Generalization of the social behaviors, speech, aggression, running, and withdrawal, from therapy session to everyday behavioral patterns, has yet to be effected. This conclusion is not to be confused with the work of other investigators who have succeeded in adding permanently to the behavior of the autistic or profoundly retarded child those behaviors that seem to be intrinsically reinforcing, such as feeding and toileting. Efforts in these areas have met with conspicuous success (1, 4, 12).

In the opinion of the direct-care personnel working daily with the children and the activity aide who coauthored this paper, one unexpected gain did result from the study. The girls who had undergone the time-out therapy may very well have become more sensitive to the response stimulus sequence where a specific behavior does result in the presentation of a concrete stimulus. It has been reported that these children have responded more quickly than most children of this type in other ongoing operant conditioning programs, such as development of feeding and dressing skills. This development may indeed be the most significant finding of the study.

The authors do not feel at this time that time-out programs are economical in terms of staff time involved and the minimal gains made by the residents who are autistic and/or profoundly retarded. It is recommended that a time-out program can probably best be utilized as part of an overall operant conditioning program, or after the most basic self-help skills of feeding, toileting, and dressing have been developed.

E. SUMMARY

Four profoundly retarded girls, three of whom displayed obvious autistic behaviors, underwent 14 months of intensive behavioral modification therapy with time-out from positive reinforcement being the basic procedure. The three types of behavior that were attempted to be reduced were aggressiveness towards self, aggressiveness towards others, and running from their living unit. The frequency of these behavioral patterns was reduced by more than 98 percent in all four girls during the therapy period. Although the experimenters were able to sustain these behavioral patterns eliminating the inappropriate behaviors in the therapy sessions itself to a variable interval reinforcement schedule of 360-1, very little of this behavior generalized from therapy to everyday patterns of behavior of the children. Four procedures to facilitate generalization were all unsuccessful. It was found, however, that time-out did seem to sensitize the children to the response-stimulus sequence that facilitated acquisition of more basic self-help behaviors. The authors concluded, however, that time-out programs with this type of child are not economical in terms of permanent behavior change and the amount of staff time involved in training. It was recommended that time-out procedures could be best used as a part of a comprehensive self-help development program or after the most basic self-help skills have already been developed.

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THE RELATIONSHIP BETWEEN SELF-ESTEEM AND PERCEIVED RECIPROCAL LIKING: A SOCIOMETRIC TEST OF THE THEORY OF COGNITIVE BALANCE*[1]

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A. INTRODUCTION

Heider's theory of cognitive balance (11, 12) has served as the prototype for a large number of subsequent theories (e.g., 1, 10, 13, 15,) which all emphasize the idea that people strive to obtain a state of consistency among their cognitions. The basic concepts in Heider's theory are entities and relations. Entities may be people (symbolized by *p* if it is the person whose life space is being considered, or by *o* or *q* if somebody else) or objects (symbolized by *x, y,* or *z*). Relations between entities may be sentiment or unit relations. Sentiment relations are attitudinal relations that refer to the way in which *p* evaluates another entity. Positive sentiments are symbolized by L (like) and negative sentiments by DL (dislike). Unit relations, not relevant to the present study, are essentially relations of belongingness. The conditions that make for cognitive balance in Heider's theory are easily summarized. Two relations are balanced if they are both positive or both negative. They are unbalanced if one is positive and one is negative. Three relations are balanced if all three are positive or if two are negative and one is positive. They are unbalanced if all three are negative or if two are positive and one is negative. It should be noted that in Heider's theory it is *p*'s perceptions of the relations between entities that are important for predicting *p*'s subsequent cognitive behavior. These perceptions may or may not correspond with whatever is taken to be the reality of the given situation.

One rather common finding reported in the literature, which is at least consistent with Heider's theory, is that people tend to like people whom they perceive as liking themselves and to dislike people whom they perceive as disliking themselves (e.g., 2, 3, 4, 5, 6, 14). This follows from Heider's theory if, and only if, one assumes that people usually evaluate themselves favorably.

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Two positive relations (*p*L*p* and *p*L*o*) should tend to induce a third relation that is positive (*o*L*p*) rather than negative (*o*DL*p*). One positive and one negative relation (*p*L*p* and *p*DL*o*) should tend to induce a third relation that is negative (*o*DL*p*) rather than positive (*o*L*p*). There is considerable empirical evidence for the assumption that people usually evaluate themselves favorably (e.g., 9). There is also, however, little doubt that there exist many individuals whose self-evaluations are primarily negative. In cases where *p* evaluates himself negatively, balance theory predicts that *p*'s liking for others and his perception of their liking for him will be inversely related. One negative and one positive relation (*p*DL*p* and *p*L*o*) should tend to induce a third relation that is negative (*o*DL*p*) rather than positive (*o*L*p*). Two negative relations (*p*DL*p* and *p*DL*o*) should tend to induce a third relation that is positive (*o*L*p*) rather than negative (*o*DL*p*).

Although Heider was not unaware of the relevance of self-esteem for balance theory (12, p. 210), he did not deal with the question in any detail. However, a study by Deutsch and Solomon (8) suggests the potential importance of considering self-esteem when making predictions from balance theory. They found that subjects who received negative evaluations from their teammate (*o*DL*p*) evaluated their teammate more favorably if they thought unfavorably (*p*DL*p*) rather than favorably (*p*L*p*) of their own performance, while subjects who received positive evaluations from their teammate (*o*L*p*) evaluated their teammate more favorably if they thought favorably (*p*L*p*) rather than unfavorably (*p*DL*p*) of their own performance. The purpose of the present study was to investigate the relationship between self-esteem and perceived reciprocal liking in a sociometric context. In accordance with balance theory it was predicted that subjects with high self-esteem, as compared to subjects with low self-esteem, would be more likely to believe that people whom they liked reciprocated these positive feelings.

B. METHOD

Subjects were 129 sixth grade children attending school in a New York City suburb. There were 61 males and 68 females. With the exception of one *S* who was 10, all *S*s were either 11 or 12 years old.

The study consisted of two data collecting sessions. In the first session *S*s completed the Coopersmith (7) Self-Esteem Inventory (SEI). This inventory, based upon the clinical judgments of five psychologists, consists of 50 items to each of which the subject responds by indicating either "Like Me" or "Unlike Me." Test-retest reliability was found to be .88 with a sample of 30 fifth graders after a five-week interval and .70 with a different sample of 56 children after a three-year interval. Support for the validity of the SEI comes from a variety of studies (7) which have found scores on it to be positively correlated with intelligence, creativity, academic achievement, stated willingness to express an unpopular opinion, and resistance to group pressure in an Asch-type conformity situation.

In the second session *S*s were requested to list (*a*) the names of the five children with whom they would most like to be in the seventh grade and (*b*) the names of all the children whom they thought would put them down on their lists.

C. Results and Discussion

Scores on the SEI were found to range from 26 to 96 with the mean of the distribution equal to 69.95 and the standard deviation equal to 15.41. The difference between the mean SEI score for males (70.39) and the mean SEI score for females (69.56) was not found to be statistically significant ($t = .30$, $df = 127$, $p > .05$). A high self-esteem (HSE) group, consisting of the 64 highest SEI scores, and a low self-esteem (LSE) group, consisting of the 64 lowest SEI scores, were formed. The difference between the mean of the HSE group (82.19) and the mean of the LSE group (57.69) was found to be statistically significant ($t = 14.58$, $df = 126$, $p < .001$). The percentage of positive sociometric choices believed by each *S* to reciprocate said positive feelings was then computed. Since each *S* listed five sociometric choices, this percentage could only assume the following values: 0, 20, 40, 60, 80, and 100. For *S*s in the HSE group the mean percentage was found to be 80.31, while for *S*s in the LSE group it was found to be 71.88. Application of a *t* test showed that the difference between these two percentages was statistically significant ($t = 2.14$, $df = 126$, $p < .05$). This finding supports the prediction advanced above. It appears that in making predictions from balance theory, at least in a sociometric context such as the one employed in this study, self-esteem is a variable that must be taken into consideration.

It would be interesting to investigate the effects of self-esteem upon negative sociometric choices; this was not done in the present study. As stated above, the general finding in the literature is that people tend to dislike people whom they perceive as disliking themselves. Balance theory predicts, however, that the magnitude of the relationship between these two variables will be positively correlated with self-esteem. Individuals with low self-esteem would, according to balance theory, be relatively less likely to believe that people whom they dislike reciprocate these negative feelings. Two negative relations (*p*DL*p* and *p*DL*o*) should tend to induce a third relation which is positive (*o*L*p*) rather than negative (*o*DL*p*).

More generally, one might raise some interesting questions regarding the relevancy of self-esteem for other cognitive consistency theories. In the review of the literature dealing with these theories it is interesting to note that, in making predictions, there often appears to be an implicit assumption of favorable self-evaluations on the part of the subjects. The theoretical need to consider self-esteem would not seem to be limited to balance theory. Further research is needed in this area.

D. SUMMARY

The purpose of this study was to test the prediction, derived from the theory of cognitive balance, that the correlation between an individual's liking for others and his perception of their liking for him is dependent upon his self-esteem. Sixth graders scoring high and low on Coopersmith's (7) Self-Esteem Inventory were requested to list (*a*) the names of the five children with whom they would most like to be in the seventh grade and (*b*) the names of all the children whom they thought would put them down on their lists. As predicted, it was found that subjects with high self-esteem were more likely ($p < .05$) to believe that people whom they liked reciprocated these positive feelings. The relevancy of self-esteem for cognitive consistency theories was suggested as a topic worthy of future investigation.

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GEOTACTIC ORIENTATION OF *LIGUUS FASCIATUS*[*]

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A. INTRODUCTION

The understanding of geotactic reactions is facilitated by a knowledge of the workings of the typical gravity receptor; namely, the statocyst within the organism. It consists of a heavy solid object, the statolith, enclosed in a fluid-filled chamber. The statolith either rests on or hangs from special sensitive cells, frequently supported by hair-like threads. When the statocyst is "tipped over" by some disturbance, the statolith exerts a different pressure on different sensitive cells. This change in the distribution of stimulation upon the walls of the statocyst initiates suitable specific reflexes of limbs, etc., which attempt to correct the orientation and restore the statolith to the normal position (6).

One avenue of research aimed at investigating the physiological mechanisms involved in geotactic responses is exemplified by those studies employing artificial stimulation of the statocyst. Most of these studies have been concerned with the effects of several conflicting forces simultaneously applied to the statolith.

Kreidl (7) was perhaps the first to recognize the experimental potential inherent in the application of conflicting stimuli to the statocyst. He replaced the statocysts of a prawn with iron filings and then subjected the animal to the action of a magnet. The organism resolved the conflicting gravitational and magnetic forces by reacting in accordance with the triangle-of-forces rule. This rule states that if the forces acting on an object are represented as to magnitude and direction by the sides of a triangle, taken in order, then they are in equilibrium (7).

Geotactic responses to normal gravitational force have also been complicated by the addition of a centrifugal force. Fraenkel (4) showed that *Littorina* crawl toward the center of a turntable rotating in a horizontal plane. Fraenkel (5) also tested *Convoluta* on a vertical plane which was rotated on a vertical axis. The turbellarians, under the simultaneous influence

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of the centrifugal and gravitational forces on the statolith, deviated from the vertical by an angle corresponding to the triangle-of-forces rule.

The general conclusion drawn from studies of this type was that the conflicting forces combined in such a way that a single resultant force was actually applied by the statolith to the statocyst wall. Hence, the resulting orientation could often have been calculated by the triangle-of-forces rule. Fraenkel and Gunn (6, p. 47) sum up the research by stating that ". . . however many and complex the forces applied to a statolith, the stimulation of the sense-cells is always single in direction and intensity."

Although the mechanism involved in geotactic orientations is well understood in those organisms possessing statocysts, this is not the case in those animals that exhibit geotactic responses without the aid of these structures. Such instances, however, are relatively few in number. Loeb (8) noted that the sea anemone exhibited a positive geotactic response, but did not possess statocysts. Dembrowsky (3) and Merton (9) made similar observations in *Paramecia*. Crozier (1) studied the reaction of *Asterina gibbosa* when it was placed on an inclined plane. The organism showed a negative geotactic orientation even though it had no statocysts. Crozier concluded that it was the pull of the weight of the animal on the attaching tube-feet that provided the stimulus for orientation. Similarly, Crozier and Navez (2) investigated the negative geotactic response in the tree snail (*Liguus fasciatus*) and found that it was the pull of the snail's shell on its body muscles that provided the stimulus for orientation.

The general conclusions drawn from studies of this nature stressed that it was the gravity reactions involved which were dependent upon the functioning of contact receptors and proprioceptors that determined orientation.

Although there have been more recent studies dealing with the geotactic orientation response, the studies cited above are most pertinent to the present research; namely, the application of conflicting forces to the organism. In the case of animals with statocysts, early research concluded that conflicting force vectors are resolved into a single resultant force which the statolith applies to the statocyst. Research in this area has reached a dead end. On the other hand, studies involving those organisms that exhibit geotactic responses even though they do not possess statocysts have dealt with two general areas: (*a*) artificial manipulation of the single, normal force stimulus; or (*b*) investigation of the geotactic response under certain physical conditions (e.g., orientation on an inclined plane).

The purpose of the present study was to investigate the effects of conflicting forces (gravity and magnetic attraction) on the negative geotactic orientation of *Liguus fasciatus*, a tree snail having no statocysts.

B. METHOD

1. *Subjects*

*S*s consisted of six tree snails (*Liguus fasciatus*). One was killed and its shell weighed in order to determine the force that it exerted on the connecting muscles. This force, the force of gravity, was calculated to be 3038 gm cm/sec. (3.1 gm × 980 cm/sec.). This force is the normal stimulus for the negative geotactic response.

2. *Apparatus*

Apparatus consisted of a vertical glass pane supported by a perpendicular wood base. Coordinate axes were drawn in the center of the pane, on the reverse side. A circle with a radius 4 cm (from the origin) and radial lines (every 10 degrees from zero to 90 degrees) were also drawn on the same pane. A runway, formed by taping two cardboard strips perpendicular to the vertical pane, was constructed to extend from the origin to a point 5 cm below it. A magnet was taped to the glass at a distance of 2 cm to the left of the origin. An attempt was made to place the magnet at a distance from the origin such that the force of the magnetic attraction would be equal to the gravitational force exerted on the organism. Iron filings were glued to the left side of the *S*'s shells.

C. PROCEDURE

The first condition consisted of running each of the five *S*s a total of five trials. The *S*s were affixed to the glass pane at the origin and allowed to crawl in the direction of their choice. The measurements taken consisted of recording the radial line from zero to 90 degrees to which the *S* was nearest at the 4 cm circular boundary. Measurements were taken at this point because beyond this point the magnetic attraction began to decrease markedly.

Due to the fact that the exact magnitude of the magnetic attraction was not known, the triangle-of-forces rule could not be validly applied. Therefore, a second condition was used to run the *S*s to aid in the validation of results.

The second condition consisted of affixing the *S*s to the glass pane at the bottom of the runway and allowing them to crawl upward until reaching the origin, at which point they were subjected to the magnetic attraction force. Measurements were recorded in the same manner as for the first condition.

D. Results

Performance was recorded for each of the five *S*s on a total of five trials. Means of these trials were computed for each *S* in both experimental conditions. Table 1 contains the trial scores and means for *S*s in the first condition (*S*s placed at the origin) and in the second condition (*S*s placed at bottom of runway). The same *S*s were used in both conditions.

The Wilcoxon composite-rank statistical method was applied to determine if a significant difference existed between the means of the *S*s in the first condition and in the second condition. A measure (sum of ranks of the means of measurements for the *S*s in the first condition) of 15 was obtained. A measure (sum of ranks of the means of measurements for the *S*s in the second condition) of 40 was obtained. For $N = 5$, a measure of 15 was significant at the .01 level of confidence.

Therefore, a significant difference between the resultant angles of orientation was found to exist between *S*s under the two conditions. The time differential in being subjected to the magnetic force significantly affected the direction of the orienting response; i.e., *S*s placed at the bottom of the runway and allowed to "crawl into" the area of magnetic attraction were less affected by it than were *S*s immediately placed in the area of the magnetic force.

TABLE 1

TRIAL SCORES AND MEANS OF RESPONSES MADE BY *S*s IN CONDITION ONE (*S*s PLACED AT ORIGIN) AND CONDITION TWO (*S*s PLACED AT BOTTOM OF RUNWAY)

*S*s	Trials 1	2	3	4	5	$\overline{X}$s
			Condition one			
1	20	30	30	20	20	24
2	20	40	30	30	40	32
3	20	10	10	10	20	14
4	10	20	20	30	30	22
5	30	20	40	20	20	26
			Condition two			
1	50	50	40	40	50	46
2	50	60	70	60	60	60
3	30	40	30	40	40	36
4	50	60	40	50	40	48
5	60	70	50	50	50	56

E. CONCLUSIONS AND DISCUSSION

Results from the first condition could not adequately support or refute the speculation that *S*s would orient according to the triangle-of-forces rule, since the exact magnitude of the magnetic attraction was not known. However, since the *S*s responses were found to be in the 10 to 40 degree range, it might be tentatively concluded that the force of magnetic attraction was considerably greater than the gravitational force of 3038 dynes.

Results from the second condition were more significant. The fact that the range of responses was 30 to 70 degrees provided evidence that the triangle-of-forces rule was not in operation, since, if it had been, then there would have been no difference in the angle of orientation taken in the two conditions. Thus, while Fraenkel (4) and others have shown that organisms with statocysts resolve conflicting forces according to this mathematical principle, this does not appear to be the case with organisms not possessing statocysts (at least in the case of *Liguus fasciatus*).

The wide variation of responses *within* each condition can be explained by differences in the weight of the *S*'s shell and in the amount of iron filings applied to the shell. Such differences would slightly alter the magnitude of the respective forces. This variation did not seem to bias the results, however, since in all cases except one, the *S*s retained their rank position established in the first condition; i.e., the *S* with the lowest mean in the first condition was also the *S* with the lowest mean in the second condition. Variations in responses were consistent across the experimental conditions.

The significant differences between the orientations taken by *S*s in the two conditions might be explained in the light of Crozier's (1) findings. After studying the negative geotactic response of *Asterina gibbosa,* he speculated that this animal (having no statocysts) tended to "maintain actively that angle with the under surface which was impressed on him in the first place by the applied force" (p. 736). Applied to the present study, even though the force of magnetic attraction was greater than the force of gravity in both conditions, it had a greater effect upon the orientation of *S*s placed at the origin than upon *S*s placed at the bottom of the runway. The former organisms tended to maintain the angle of orientation elicited by the stronger force at the origin (i.e., magnetic) while the latter *S*s tended to maintain the angle of orientation elicited by the stronger force at the bottom of the runway (i.e., gravitational).

With regard to the physiological mechanisms involved, further research is needed to identify the nature and functions of the contact receptors and proprioceptors which, in the absence of statocysts, might be in operation.

F. SUMMARY

An important consideration in the study of a particular organism is the way in which it orients to its immediate physical environment. There exists in the animal world a variety of orienting responses elicited by specific environmental cues. Such orientations represent highly adaptive responses that enable the organism to establish and maintain the position or condition most conducive to normal physiological functioning. Studies of geotactic orientations have centered on organisms possessing statocysts. Results have often been discussed according to the triangle-of-forces rule. In organisms not having statocysts, the results that have been found generally center on the functioning of contact receptors and proprioceptors. The present research attempted to investigate the effects of conflicting forces: gravity, as well as magnetic attraction, on the negative geotactic orientation of *Liguus fasciatus*. Results suggested the effect of each force as well as the significance of *S* placement in each condition.

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ADJUSTMENT TO SAME SEX AND OPPOSITE SEX IN COEDUCATIONAL AND NONCOEDUCATIONAL HIGH SCHOOLS*[1]

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A. INTRODUCTION

It would appear reasonable to assume that a student in a coeducational high school should be better adjusted to members of the opposite sex than a student in an all-male or all-female school because of his greater opportunity to interact with members of the opposite sex. In a similar way, a student in a noncoeducational school might be better adjusted to members of his sex than a student in a coeducational school because of the greater interaction with members of the same sex. Further, it might be expected that in coeducational schools a senior student would be better adjusted to the opposite sex than a freshman student. A similar, but smaller freshman-senior difference might be found in noncoeducational schools. The purpose of the present study is to test these assumptions in the form of the following hypotheses:

1. Students in coeducational schools are better adjusted to the members of the opposite sex than students in noncoeducational schools.

2. Seniors are better adjusted to the opposite sex than freshmen.

2a. This is especially true for the coeducational school.

3. A student from a noncoeducational school is better adjusted to the same sex than students from coeducational schools.

B. METHOD

The subjects were 184 students from three Catholic schools in the San Francisco Bay Area. Twenty-three students were in each of the eight com-

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binations of type of school (coed *versus* noncoed), year in school (freshmen *versus* seniors), and sex.

An inventory was developed with use of selected statements dealing with social adjustment from the Jr.-Sr. High School Personality Questionnaire (1) and the Minnesota Inventory of Social Behavior (2). Each selected statement was transformed into two items: one that referred to social relationships with the opposite sex and one that referred to social relationships with the same sex. In all, there were 78 questions in the inventory.

The inventory was administered in the classroom after distribution by the teacher. Each student was assured of anonymity and did not sign the test booklet or the answer sheet.

C. RESULTS

Freshmen from the coeducational school were significantly better adjusted toward the opposite sex than were freshmen from noncoeducational schools ($\overline{D} = 6.96$, $t = 2.75$, $p < .05$). However, school type did not affect adjustment toward the opposite sex for seniors ($\overline{D} = .39$, $t = .12$, n.s.). Thus Hypothesis 1, that students from coeducational high schools should be better adjusted to the members of the opposite sex than those from noncoeducational high schools, is supported for freshmen but not for seniors.

The freshman-senior difference in adjustment to the opposite sex was not significant ($\overline{D} = .37$, $t = .14$) in the coeducational school, but was significant in the noncoeducational schools ($\overline{D} = 9.54$, $t = 2.57$, $p < .05$), with the seniors reporting the higher level of adjustment. This supports Hypothesis 2 only in the noncoeducational schools and disconfirms Hypothesis 2a.

For males, students from the noncoeducational school were significantly better adjusted to their own sex than were males from the coeducational school ($\overline{D} = 17.52$, $t = 6.79$). However, school type did not affect the adjustment toward own sex for females. Freshman-senior differences were small and not significant. Hypothesis 3 is supported for males, not for females.

D. DISCUSSION

The higher degree of adjustment to the opposite sex by freshmen from coeducational schools compared to freshmen from noncoeducational schools can be explained in two ways. It could be that differential socialization during the freshman year accounts for this difference. However, the fact that the freshman-senior differences seem to indicate the opposite type of differential socialization (i.e., noncoeducational students gain more, not less, in adjustment to the opposite sex between the freshman and senior years) makes this a tenuous explanation. It seems more likely that (*a*) many students who choose a noncoeducational high school do so in part because they feel inadequate in their relationships with the opposite sex and, (*b*) parents who have not encouraged interaction with the opposite sex are more likely to choose a noncoeducational school for their child.

A change in adjustment to the opposite sex from the freshman to the senior year was unexpectedly found only in the noncoeducational schools. Does this mean that the lack of interaction with the opposite sex in school-related activities contributes positively to social competence in relation to the opposite sex? A second interpretation seems more likely.

This second interpretation involves consideration of each student's reference group, the group to which a student looks for a standard to judge his own behavior. (It should be recalled, also, that the adjustment scores are based on a self-rating measure.) Many freshmen from noncoeducational schools would evaluate themselves in relation to a reference group composed not only of their current classmates but also of their previous peers who selected coed high schools. The senior, however, is likely to have a reference group that no longer includes the students from coed schools. The reference group to which he now belongs is one containing almost exclusively members of his high school class. This interpretation proposes (*a*) that a senior student from a coeducational school with a given score on adjustment to the opposite sex is actually better adjusted than a senior from a noncoeducational school with the same score when adjustment is defined by behavior rather than self-report, and (*b*) that the social behavior of a freshman student who feels socially competent is probably less competent than that of a senior who reports himself to be of equal competence.

E. SUMMARY

A 78-item questionnaire was administered to a total of 92 freshman and 92 seniors in three Catholic high schools. The hypothesis that students in the coeducational school would be better adjusted to the opposite sex was supported for freshman but not for seniors. Seniors in the noncoeducational schools reported better adjustment to the opposite sex than freshman, but unexpectedly this was not true in the coeducational school. It was speculated that the results were due to the different comparison groups *S*s used in evaluating their adjustment. Male *S*s in the noncoeducational school reported better adjustment to their own sex than males in the coeducational school. School type did not affect adjustment to the same sex for females.

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RESPONSE SET ANALYSIS OF A PATERNAL ATTITUDE RESEARCH INSTRUMENT (PARI)*[1]

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A. INTRODUCTION

Several studies (e.g., 2, 3, 4, 5, 9) suggest that response sets may modify an *S*'s responses to questionnaires. A response set may be defined as the *S*'s tendency to respond consistently to test items in terms of variables other than item content. Such response sets may be due either to the *S*'s tendency to "agree" consistently (acquiescence set) or to "disagree" (opposition set) or to give "extreme" answers (extreme set). Items may be phrased in such a way that the *S* may feel a strong need to "agree" or "disagree" with the statements. Previous studies suggest that acquiescence set had a strong influence on the scores of the Minnesota Multiphasic Inventory (MMPI), the California F Scale of Authoritarianism, and the Mother's Form of the Parental Attitude Research Instrument (PARI)—(e.g., 1, 11). Zuckerman (10) reversed the items of the Mother's PARI and suggested that item reversal reduced the acquiescence set considerably.

The objective of this study was to investigate the response set biases of the Father's PARI and to suggest means that would minimize response set biases in the assessment of paternal attitudes. Schaefer (6) originally developed a Father's Form of the PARI. Schludermann and Schludermann (7) developed a shortened version (Q1) of the original Father's PARI and then developed another version (Q2) of the Father's PARI by reversing the meaning of all Q1 items. They also investigated the factor structure of both Q1 and Q2 (7, 8) and found evidence suggesting that response set biases had produced somewhat different factor structures between Q1 and Q2. In this study the investigators attempted to determine to what extent acquiescence set, opposition set, and extreme set affected individual scale scores of Q1 and Q2, and to what extent they affected the overall factor structure.

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B. METHOD

1. *Subjects*

Previous study (7) had indicated that neither differences in marital status nor amount of experience with the father-role was a crucial variable for differentiating paternal attitudes towards child rearing on PARI scales. Two hundred and sixty-nine male college students volunteered to participate in the study. The *S*s were between the ages of 18 years and 22 years. They were enrolled in an introductory psychology course and represented a cross-section of university departments. The majority of the *S*s were from urban Manitoba.

2. *The Instrument and the Procedure*

The Father's Form of Parental Attitude Research Instrument (Father's PARI) as originally developed by Schaefer (6) consisted of 30 scales of eight items each. Schludermann and Schludermann (7) shortened Schaefer's instrument to 20 scales of five items each by selecting scales and items on the basis of reliability and relevance. The resulting questionnaire (Q1)[2] contains 100 items expressing various paternal attitudes. The *S* is asked to indicate whether he "strongly agrees," "mildly agrees," "mildly disagrees," or "strongly disagrees" (scored as 4, 3, 2, and 1, respectively) with the attitude expressed by that item. The scale score is the sum of the scores of the items composing that scale. All items in Q1 were unreversed and scored the same way as described here.

The items in Q2[2] were reversed in such a way that if an *S* were logically consistent, agreement with a given Q1 item implied disagreement with the corresponding Q2 item. The scoring system of Q2 was the reverse of that of Q1: i.e., "strongly agree," "mildly agree," "mildly disagree," and "strongly disagree" were scored as 1, 2, 3, and 4, respectively. Thus a perfectly consistent *S* should obtain the same scores on Q1 and Q2. All items in Q2 were reversed and therefore scored in the manner described here.

All *S*s first answered Q1 and then answered Q2 after a one-week interval. Schaefer's standard instructions were used.

C. RESULTS

1. *Comparison of Q1 and Q2 Scales*

The means and standard deviations of the Q1 and Q2 scale scores were calculated (Table 1). Comparison of the corresponding mean scale scores of

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[2] Copies of Q1 and Q2 can be obtained either directly from the authors, or from NAPS. Copies of unreversed and reversed forms of the Father's PARI have been deposited with NAPS. Order Document No. 01019 from CCMIC National Auxiliary Publications Service, 909 Third Avenue, New York, New York 10022; remitting $2.00 for microfiche or $5.00 for photocopies.

Q1 and of Q2 revealed that on some scales (e.g., Encouraging Verbalization) the means were almost equal, while on other scales (e.g., Nonpunishment) there were great discrepancies between the means.

The correlation coefficients between corresponding Q1 and Q2 scale scores were calculated (Table 1). In the interpretation of the correlation coefficients of this table, it is helpful to remember that with the sample size ($N = 269$) of this study, a correlation coefficient has to be greater than ±.20 in order to be significantly different from zero (one percent level, two-tailed test). There were 10 scales where the correlations between corresponding Q1 and Q2 scales were moderate (between .40 and .60), five scales where the correlations were low (between .20 and .39), and five scales where the correlations were not significantly different from zero.

2. *Response Set Bias*

By comparing an *S*'s response to corresponding Q1 ond Q2 items, three responses set scores were calculated for each *S:*

a. Acquiescence set was defined as the tendency to agree with mutually contradictory items. An *S*'s acquiescence set was measured by calculating the percentage of items where the *S* either "agreed" or "strongly agreed" with corresponding Q1 and Q2 items. For this sample the mean acquiescence set was 11.1 with a standard deviation of 5.2.

b. Opposition set was defined as the tendency to disagree with mutually contradictory items. An *S*'s opposition set was measured by calculating the percentage of items where the *S* either "disagreed" or "disagreed strongly" with corresponding Q1 and Q2 items. The mean opposition set was 7.6 with a standard deviation of 6.9.

c. Extreme (*response*) *set* was defined as the tendency to check off the extreme ends of the choice points. The extreme set was measured by calculating the percentage of items with which the *S* either "strongly agreed" or "strongly disagreed". The mean extreme set was 16.1 with a standard deviation of 8.8.

The correlation coefficients between the three response set scores were calculated. A negative correlation (—.36) was obtained between acquiescence set and opposition set. The extreme set had a negative correlation (—.34) with the acquiescence set and a positive correlation (.32) with the opposition set.

3. *Response Set and Scale Scores*

The three response set scores were then correlated with the scale scores of Q1 and Q2 (Table 1). As was mentioned before, correlation coefficients had to be higher than ±.20 in order to be significantly different from zero. Cor-

TABLE 1
FATHER'S PARI: RESPONSE SET BIAS

Scales[b]	Mean		*SD*		Correlation coefficients[a]						
						Acq.[c] set *vs.*		Opp.[c] set *vs.*		Ext.[c] set *vs.*	
	Q1	Q2	Q1	Q2	Q1 *vs.* Q2	Q1	Q2	Q1	Q2	Q1	Q2
1	15.3	15.5	2.2	2.1	43	—07	—36	10	20	34	38
2	9.6	10.6	2.2	1.8	12	39	—01	—23	—07	—30	—37
3	9.7	10.4	2.5	2.1	31	47	10	—17	04	—25	—27
4	10.1	11.9	2.7	2.8	54	28	08	—19	08	—06	—05
5	10.5	11.5	2.7	2.7	56	25	06	—17	01	—18	—22
6	15.9	14.1	2.4	2.3	27	02	—34	—03	07	29	25
7	9.7	15.2	2.4	2.4	28	15	—24	—13	18	—23	17
8	12.9	9.9	2.6	2.1	16	22	—15	—19	06	09	—22
9	9.7	10.5	2.4	2.0	43	39	05	—28	04	—29	—35
10	12.5	12.2	3.1	2.3	40	33	—01	—18	11	—01	—10
11	9.6	9.9	2.6	2.2	49	52	17	—28	—03	—33	—37
12	12.9	13.1	2.6	2.5	46	15	—19	—21	—03	03	—05
13	12.6	14.3	2.6	2.2	49	24	—10	—15	16	—05	17
14	8.4	10.5	2.1	2.3	54	44	25	—27	—11	—34	—33
15	13.7	15.1	3.2	2.1	47	30	—18	—15	07	00	20
16	12.7	15.4	2.6	1.9	05	22	—19	—18	14	09	27
17	12.7	13.9	3.1	1.9	02	23	—18	—21	04	07	14
18	13.5	11.1	2.6	2.2	38	31	09	—09	—05	06	—28
19	12.5	9.2	3.2	2.0	01	42	00	—18	00	—14	—39
20	14.3	14.7	2.3	1.9	33	13	—22	—04	17	27	26

[a] For all correlation coefficients decimal points have been omitted (e.g., 43 is .43).

[b] Scales: 1. Encouraging Verbalization, 2. Fostering Dependency, 3. Breaking the Will, 4. Harsh Punishment, 5. Deception, 6. Marital Conflict, 7. Nonpunishment, 8. Irresponsibility of Father, 9. Suppression of Aggression, 10. Deification of Parent, 11. Exclusion of Outside Influence, 12. Irritability, 13. Strictness, 14. Suppression of Sexuality, 15. Ascendency of Husband, 16. Inconsiderateness of Wife, 17. Complaint of Ascendancy of Wife, 18. Suppression of Affection, 19. Change Orientation, 20. Forcing Independence.

[c] Abbreviations: Acq. = Acquiescence; Opp. = Opposition; Ext. = Extreme.

relations between response set scores and scale scores that were below that level were interpreted as suggesting that the contribution of the response set to that scale score was negligible. On the other hand, correlations higher than ±.30 might be regarded as evidence that the scale score was seriously biased by the response set.

According to these criteria the acquiescence set seriously biased nine scales of Q1 but only two scales from Q2. On the other hand, the acquiescence set had a negligible effect on five Q1 scales and on 15 Q2 scales. The results therefore suggested that Q2 was much less vulnerable to the influence of the acquiescence set than Q1. The effect of the opposition set on the scale scores of both Q1 and Q2 was much less evident than the effect of the acquiescence set. The extreme response set exerted a serious bias on four Q1 scales and on six Q2 scales. It had negligible effect on 11 Q1 scales and on only six Q2 scales. The result therefore suggested that item reversal (i.e., restating Q1 items in the negative terms of Q2) had reduced considerably the effect of acquiescence sets, but had increased somewhat the effect of the extreme set.

4. *Response Set and PARI Factors*

By combining the 20 Q1 scales, the 20 Q2 scales, and the three response set measures, a 43 × 43 correlation matrix was generated. This correlation matrix was then subjected to a factor analysis involving the principal axes solution, an eigenvalue of 2.0 as a cutoff criterion, and the Varimax rotation. Four factors emerged, which accounted for 40.9 percent of the total variance: F_1, F_2, F_3, and F_4.

F_1 may be interpreted as the Authoritarian Control factor. Nine scales of Q1 but only three from Q2 had significant (greater than ± .40) loadings on this factor. It is interesting to note that the loading of the acquiescence set was high and positive (.68), while the loading of the opposition set was negative and almost significant (—.35).

F_2 may be called a Marital Conflict factor. Seven scales from Q1 but only one scale from Q2 and none of the three responses set measures had significant loadings.

F_3 may be interpreted as a Strictness factor. Four scales from Q1 and seven scales from Q2 but none of the response set measures had significant loadings. It is interesting to note that the four Q2 scales, which corresponded to the four Q1 scales with significant loadings, also had significant loadings on this factor. The results suggest that the Strictness factor was not significantly biased by any response set.

F_4 was labelled as the Antidemocratic Attitude factor. Nine scales from

TABLE 2
VARIMAX FACTOR ANALYSIS: FATHER'S PARI, Q1, Q2, AND RESPONSE BIAS COMBINED[a]

	Factor 1		Factor 2		Factor 3		Factor 4	
Scales[b]	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2
1							—.55	—.56
2	.38						.35	.52
3	.49					.44		.51
4	.34		.39		.42	.58		
5		—.31	.58	.33			.33	.45
6		—.40	.55					
7					—.59	—.43		
8		—.46	.61					.30
9	.54			—.40				.41
10	.69					.44		.37
11	.66						.39	.65
12		—.41	.69	.51				
13	.53				.42	.67		
14	.59	.32					.34	.49
15	.49		.34		.41	.61		
16			.53			.43		
17			.51			.37		
18	.52							.44
19	.57							.56
20			.40				—.31	
Acq. set		.68						
Opp. set		—.35		—.35		.32		
Ext. set						.33		—.74

[a] Factor loadings less than ±.30 have been omitted from this table.
[b] For names of scales and explanation of abbreviations, see Table 1.

Q2 but only one scale from Q1 had significant loadings on this factor. The Q2 attitude scales which defined this factor were similar to the Q1 scales which defined the Authoritarian Control factor. Six out of the nine scales with significant loadings on F_4 had corresponding Q1 scales with significant loadings of F_1. The extreme set had high negative loading (—.74) on F_4.

Careful comparison of Tables 1 and 2 suggested similar interpretations about the effects of response set biases on scales: acquiescence set tended to bias more Q1 scales than Q2 scales, while the extreme set tended to bias more Q2 than Q1 scales. Eight of the Q1 scales which were seriously biased by the acquiescence set (i.e., correlated with acquiescence set more than .30) also had significant loadings on F_1, which was the only factor with significant loadings on the acquiescence set. On the other hand, six of the Q2 scales which were seriously biased by the extreme set (i.e., correlated with extreme set more than ± .30) also had significant loadings on F_4, which was the only factor with significant loadings on the extreme set. The study thus indicated that Q1 and Q2, which were designed to be conceptually similar, were subject to two different types of response biases. This may be attributed to differences in the direction and phrasing of items in the two Qs. Q1 items stated in a positive direction tended to elicit acquiescence set; in contrast, corresponding items in Q2 phrased in a reversed direction tended to elicit extreme response set.

D. Discussion

The results of this study on the Father's PARI follow the same general trend as Zuckerman's (10) study on response bias with the Mother's PARI. The Father's PARI items positively stated were seriously affected by acquiescence set, but the effect of this response bias was reduced by reversing the meaning of the items. On the other hand, item reversal tended to increase the effect of extreme set. The influence of opposition set on the PARI scales was minimal. Acquiescence set tended to bias the scales defining the Authoritarian Control factor, whereas the extreme set tended to bias the scales defining Antidemocratic Attitude factor. Response sets had negligible effects on the Marital Conflict and Strictness factors.

The results of this study are relevant to future researchers intending to use the Father's PARI. Table 1 provides scale-by-scale information about the biasing effects of any of the three response sets. Consequently, it is possible to construct a new Father's PARI by selecting from Q1 and Q2 those scales that have minimal acquiescence set. Such a procedure would greatly reduce the possibility of obtaining highly inflated scores on scales related to the Authoritarian Control factor. The investigators suggest that scales 1, 5, 7, 8, 12, 16, and 20 may be taken from Q1, while the other scales should be taken from Q2. Such a procedure would increase somewhat the influence of the extreme set. However, in most research studies it is more desirable to minimize the acquiescence set than to minimize the extreme set. Future users of the Father's PARI may weigh the relative risks of acquiescence *versus* extreme sets, and combine Q1 and Q2 scales in a way that is most relevant to the research objectives.

E. Summary

Male college students ($N = 269$) completed both an unreversed (Q1) and a reversed (Q2) version of the Father's PARI. By comparing answers to both questionnaires three response set measures were calculated: acquiescence set, opposition set, and extreme set. The acquiescence set correlated most highly with those Q1 scales that related to authoritarian control. The extreme set correlated most highly with several Q2 scales. Factor analysis yielded very similar results. The investigators suggested a method of devel-

oping a new Father's PARI with minimized acquiescence set, by selecting appropriate Q1 and Q2 scales.

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PERSONALITY STYLES OF STUDENT ACTIVISTS*

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A. INTRODUCTION

Studies of student activism (1, 2, 3, 5, 6, 7) have shown a somewhat consistent cluster of personality variables that differentiate activists (usually left activists) from other students. Typically, activists are portrayed as more flexible, receptive to change, unconventional, and tolerant of ambiguity than nonactivists, and also more restless, rebellious, and emotionally open and expressive. They tend also to be nonauthoritarian and religiously liberal; and their intellectuality runs more to the aesthetic, self-reflective, and philosophic than to the scientific or technical. While most of these studies make no mention of sex differences, the work of Haan, Smith, and Bloch (3) suggests that the road to activism is different and somewhat rougher for women than for men. In general Haan *et al.* found that female students who were most advanced in their moral reasoning (and most active politically) were prone to describe themselves as rebellious, guilty, doubting, and a disappointment to their mothers. Since this was not the case with the morally advanced and politically active men, it seemed reasonable in the present study to make separate analyses for each sex and look at the personality styles of activists with an eye to possible sex differences.

B. METHODS

1. *Setting*

On December 13 through 16, 1967, there was a strike by students at the University of Rochester in response to what was perceived by many as an arbitrary act by the Provost of the University in punishing some graduate students who had taken part earlier in the year in a sit-in demonstration against the appearance on campus of a recruiter from Dow Chemical Company.

2. *Subjects*

Within three weeks of the strike a random sample of 140 (about 5 percent) full-time University of Rochester undergraduates was sent a brief question-

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naire asking them to indicate whether they supported the strike, if so to what extent, and how many hours, if any, they had picketed. One-hundred twenty-six students (87 percent) responded to the questionnaire. Then in February the subjects were contacted again and asked to come in for an hour and a half of testing for which they would be paid. Eighty-six, or 59 percent of the original sample, returned for this more extensive testing. Although the test-takers showed a slight tendency to be those students who had expressed greater support for the strike than the nontest-takers, there remained in the sample sufficient numbers of both supporters and nonsupporters of the strike to make meaningful comparisons possible. In addition, this potential biasing effect was offset by the fact that one of the measures reported here (the Personality Research Form) had been administered at college entrance, prior to the strike. In this respect the present study is unique in collecting personality data at a point in time prior to the criterion act defining political activism, when there was no opportunity for either group to bias the outcome and cast themselves in an unduly favorable light.

3. *Measures*

a. Strike questionnaire. Although the mailed questionnaire referred to above consisted of three questions regarding degree of support, whether or not *S* picketed, and hours spent picketing, correlations among the measures were high; and since the statistical procedures to be used required dichotomization, the picket–no-picket question was used as the criterion. In the context of this paper, "activist" is defined by the criterion of picketing during this strike.

b. The Activities Index—AI—and College Characteristics Index—CCI (*9*). These are measures of 30 needs and 30 corresponding environmental presses. All students who came in for the testing session, except members of the class of 1969, took the AI and CCI. The total $N = 59$, with 28 picketers and 31 nonpicketers.

c. Jackson Personality Research Form—PRF (*4*). This is a sophisticated measure of 20 Murray-type needs, administered at college entrance to all students in the classes of 1970 and 1971. The total *N* of 38 was evenly divided between picketers and nonpicketers.

Two sets of analyses were carried out. The first measured the correlation between the three measures of strike support and the personality variables in the three instruments. The second was a discriminant function analysis which began by separating *S*'s by sex and whether or not they picketed. For each instrument eight factors were extracted—a number sufficient to account for from 74 percent to 90 percent of the reliable variance. With use of picketing-nonpicketing as the criterion, these factors were rotated orthogonally, and factor scores were derived. A discriminant function analysis was then used to test the significance of the relationship between picketing and scores on these factors. Since these analyses were done separately for each sex, there is an opportunity to examine differences associated with sex as well as differences associated with activism.

C. RESULTS

Table 1 presents the significant correlations between picketing and the personality variables measured. In this preliminary overall analysis there is no breakdown as to sex of *S*. The PRF shows activists to have a higher need for Change and a lower need for Cognitive Structure (i.e., a higher tolerance for ambiguity) than nonactivists. Similarly, the AI shows activists with higher needs for Change and lower needs for Conjunctivity (planfulness) and Deference than nonactivists. The CCI, a measure of perceived environmental press, shows activists seeing their environment as less orderly and more rich in opportunities to fantasize and reflect than nonactivists.

TABLE 1
SIGNIFICANT CORRELATIONS BETWEEN PICKETING AND PERSONALITY VARIABLES[a]

Instrument	Variable	Correlation
PRF ($N = 38$)	Change*	+.48
	Cognitive Structure*	—.46
AI ($N = 59$)	Change*	+.33
	Conjunctivity	—.29
	Deference	—.29
CCI ($N = 59$)	Order	—.29
	Reflectiveness	+.33

[a] Positive correlations indicate picketers scored higher than nonpicketers.
* Indicates $p < .01$. Other correlations $p < .05$.

Table 2 presents the results of the discriminant function analysis, which shows that there is no personality measure in which optimally weighted factor

TABLE 2
DISCRIMINANT FUNCTION ANALYSIS OF PERSONALITY MEASURES AS A PREDICTOR OF PICKETING BEHAVIOR

Sex	PRF	AI	CCI
Men	$F = 2.47$ $p = .11$	$F = .78$ $p = .63$	$F = 1.49$ $p = .23$
Women	$F = 1.72$ $p = .19$	$F = 2.13$ $p = .07$	$F = .76$ $p = .64$

scores can predict picketing at commonly accepted levels of significance. When we look at individual factors, however, we see a few probability values beyond .05 and others which, although having higher probabilities of chance occurrence, form part of a fairly coherent and suggestive picture. Table 3 lists those factors and the names of the five variables that load highest on each. The numbers of the factors are arbitrary and do not denote similarity across instruments or sexes. The signs of the factor loadings have been adjusted so picketers score higher on each than nonpicketers.

D. DISCUSSION

The data presented in Table 1 establish, in a rough way, the articulation of these data with those in numerous other studies (1, 3, 5, 6, 7, 8, 10) that show political activists (usually left activists) to be more flexible, tolerant of ambiguity and welcoming of change, and less orderly, planning, and deferent to authority, than other students. This replication of the findings between different instruments, one of which (PRF) was administered well before the criterion act of picketing occurred, was taken by the author as a kind of hunting license to look at the data from the discriminant function analysis, somewhat freed of the usual constraints of the 5 percent significance level. Thus, despite the fact that none of the *F* values from the discriminant function was significant, individual factors that tended to discriminate between picketers and nonpicketers were examined. This was done because of the similarity of the data in Table 1 to the data from other studies, the existence of significant differences on individual factors, and the meaningful convergence of these factors which derive from three separate instruments.

Table 3, column 1, factor 1, shows male activists to be more interested in hard work and in controlling their environment, less suspicious, defensive, and quarrelsome, and more colorful and conspicuous than nonactivists. Factor 2 has two of the same scales, but emphasizes the activist's tolerance of ambiguity and spontaneity, his low need for order and neatness, his personal openness and lack of suspiciousness, and his rejection of hard work. Factor 3 shows male activists as more willing to accept blame or criticism, less defensive and guarded, more playful, colorful, and conspicuous, and less concerned about the restrictions that relationships with others may impose on one's freedom.

It might be well to comment on some consistencies and inconsistencies in the results to this point before we look at the data on men from the other instruments. Defendance has loaded on each factor, consistently showing activists as less defensive, suspicious, and guarded than nonactivists. In factor 1 it is part of a picture of nonhostile dominance through persistent work.

TABLE 3

Factors Discriminating Picketers from Nonpicketers[a]

PRF		AI		CCI	
		Men			
Factor 1 ($p = .06$)		*Factor 1* ($p = .19$)		*Factor 1* ($p = .02$)	
Endurance	+.80	Objectivity	+.91	Affiliation	+.79
Dominance	+.70	Conjunctivity	−.66	Sensuality	+.73
Defendance	−.50	Fantasied Achievement	−.55	Humanities, Social Sciences	+.72
Aggression	−.40	Order	−.48	Reflectiveness	+.66
Exhibition	+.40	Deference	−.42	Understanding	+.54
Factor 2 ($p = .05$)				*Factor 2* ($p = .08$)	
Cognitive Structure	−.95			Counteraction	−.86
Order	−.52			Ego Achievement	−.77
Defendance	−.38			Exhibitionism	−.48
Play	−.24			Achievement	−.33
Endurance	−.23			Energy	−.34
Factor 3 ($p = .12$)					
Abasement	+.89				
Defendance	−.68				
Play	+.24				
Autonomy	−.47				
Exhibition	+.31				
		Women			
Factor 1 ($p = .19$)		*Factor 1* ($p = .07$)		*Factor 1* ($p = .15$)	
Order	−.94	Nuturance	+.83	Sensuality	+.87
Cognitive Structure	−.88	Reflectiveness	+.49	Humanities, Social Sciences	+.77
Impulsitivity	+.81	Practicalness	+.48	Impulsiveness	+.76
Harm Avoidance	−.46	Order	+.38	Reflectiveness	+.75
Autonomy	+.44	Ego Achievement	+.35	Affiliation	+.55
Factor 2 ($p = .01$)		*Factor 2* ($p = .01$)		*Factor 2* ($p = .14$)	
Change	+.90	Change	+.86	Science	−.84
Autonomy	+.55	Impulsiveness	+.77	Counteractive	−.77
Social Recognition	−.47	Conjunctivity	−.73	Understanding	−.73
Impulsivity	+.31	Order	−.63	Abasement	+.67
Cognitive Structure	−.25	Harm Avoidance	−.48	Achievement	−.66
		Factor 3 ($p = .18$)			
		Understanding	−.79		
		Reflectiveness	−.59		
		Science	−.57		
		Achievement	−.51		
		Practicalness	−.48		

[a] Picketers have higher mean scores.

In factor 2 it is part of a free flexible disinterest in certainty and order. In factor 3 it combines with a willingness to accept criticism as part of a fairly light and easy-going interpersonal openness and willingness to get close to others. A second, less striking, consistency is the acceptance of Exhibition by picketers in factors 1 and 3.

The inconsistencies occur in the way the activists alternately seem to embrace and reject work and play. In factor 1, Endurance is the defining variable; yet in factor 2 it is rejected by activists, apparently seen as an aspect of rigid planfulness. Similarly, play is inexplicably rejected as part of the flexible planlessness in factor 2, but is accepted as part of the interpersonal openness in factor 3. Beyond saying that activists are ambivalent about them (!) the meaning of these inconsistencies is opaque.

The next measure, the AI, shows male activists as strongly rejecting superstitious beliefs and practices and as much less committed than nonactivists to neatness and careful orderly planning. The activist fantasizes less about great achievements he might make and is less deferential to those who are commonly recognized as having achieved significantly. This factor is quite similar to factor 2 in the PRF, which also shows activists as less interested in neatness and orderly planning than their nonactivist colleagues.

The CCI, in asking *S*s to describe their college environment, measures the college, the subculture in which the particular student lives, and the perceptual set through which these first two are seen. Factor 1 shows male activists describing their environment in many ways more positively than nonactivists. They see more student-student and student-faculty contacts than do nonactivists, more opportunities for esthetic and sensuous experiences, and more interest in the humanities and social sciences. Activists see the college environment as richer in opportunities for wonderment about life and the world. The rub comes, however, with factor 2 where activists see their fellow students as passive and withdrawing, especially in the face of administrative and faculty efforts to control them. They see these students as shy, colorless, and uninvolved politically, socially, and academically. What these results seem to mean is that activists are quite pleased (at least relative to the nonactivists) about many of the intellectual opportunities they find at the university and the interpersonal closeness they have found, presumably with a small group of friends and congenial faculty. When they look at the political, social, and even academic situation campus-wide, however, the activists are struck by the lack of impact students have on administrative and faculty decisions that affect them and by the passivity of their fellow students in the face of this powerlessness. It would be helpful to know to what extent these views were shaped by the strike, but lack of predata on the CCI makes this information unavailable.

Looking next at the women, we find the activist-nonactivist differences to be similar in some ways to those found for men, and in some ways quite different. Factor 1 of the PRF shows activists to be unconcerned about personal orderliness or planning, tolerant of ambiguity, spontaneous and uninhibited, disregardful of physical safety, and resentful of restraints even if it means some loss of personal closeness with others. Factor 2 is quite similar, including three of the same scales (Autonomy, Cognitive Structure, and Impulsivity) loading in the same direction, but emphasizing the activist's restless quest for new and different experiences and her unwillingness to seek at least the traditional sorts of social recognition and acceptance.

In comparison with the factors that differentiated activists from nonactivists among the men, there are some similarities and some subtle but interesting differences between men and women activists. Activists of both sexes reject the need for order and cognitive structure. The women, however, combine that with a more hell-bent, impulsive, danger-courting wildness not present in the men. In addition the women activists reject concerns about reputation and acceptance, and emphasize their need to be free of constraints, even those inherent in personal closeness. The male activists, by contrast, portray themselves as undefensive, acceptant of criticism, and more interested in personal closeness than concerned about the constraints that that imposes. Although Autonomy is the only scale that loads oppositely for the men and women activists (endorsed by the women, rejected by the men), Affiliation, while not loading particularly high on any of the factors under discussion, is directionally opposite for the two sexes, being endorsed by the male activists and rejected by the females. There is thus some suggestive data from the PRF that men and women activists have somewhat different personality styles, especially as regards issues of interpersonal closeness, even though they are similar in their rejection of neatness and orderliness.

The AI, factor 1, which is predominantly defined by the need for Nurturance, shows activist women to be more interested than their nonactivists sisters in helping people, especially those who are weak, sick, or elderly. This is understandably linked with a valuing of social and political involvement and power (Ego Achievement), and somewhat less clearly related to a desire for expertise at practical household and business affairs, for order, and for reflective thinking. The appearance of Order on this factor (even with a low loading) is particularly puzzling because of the consistency with which activists of both sexes have previously shown themselves to be uninterested in orderliness or planfulness. It is worth noting, however, that a wish to help others is what primarily defines this factor, and it may be that the other needs, especially Order and Practicalness, are seen as instrumental to that goal.

Factor 2 again shows activists more needful of change, spur-of-the-moment spontaneity, and impulsivity than nonactivists. It also shows them as avoiding planning, orderliness, and caution. This is very similar to factor 1 of the PRF in the low value set on neatness and planning and the high value set on impulsivity, spontaneity, and unconcern for physical safety.

In factor 3, activist women are shown as less academically and intellectually interested, particularly where that interest is focused on the physical sciences. They are also less motivated by achievement and less interested in practical household or business concerns. While there are two "contradictions" between this factor and factor 1 (Reflectiveness and Practicalness load oppositely on the two factors), the general outline of the meaning of the two factors seems clear and distinct between the two: factor 1 centers around the wish to help other people, while factor 3 centers around academic interest and achievement. Activists are high on factor 1 (helping people) and low on factor 3 (academic interest and achievement).

Data from the CCI show sex differences to be minimal. Women activists share with their male counterparts a perception of their college environment as richer, in a number of respects, than that perceived by the nonactivists. Factor 1 shows activists seeing more opportunities for esthetic and sensuous experience, more interest in the humanities and social sciences, more spontaneous enjoyment, more wonderment and introspection, and more student-student and student-faculty contact. Factor 2 shows activist women perceiving less interest in, or opportunity to pursue, the physical sciences or intellectual interests more generally. They also see their fellow students as passive in the face of administration and faculty efforts to control them, as weakly tending to accept blame, and as uninterested in achievement. This factor is similar to the men's factor 2 in portraying the students as weak, passive, and unwilling to assert themselves in struggles with authorities. Energy, ranked 5 on men's factor 2, does not appear in the first five scales on women's factor 2, but is ranked 6 and loads at —.51, heightening still further the remarkable similarity in how men and women activists view their college environment. Both groups of activists are relatively pleased with the intellectual, interpersonal, and "atmosphere" aspects of their college world, but they share a disappointment over what they see as students' passivity and willingness to let others control them.

There are three major foci in these data. The first is that across two different personality measures (one given before and the other after the occurrence of the criterion acts that defined activism), there is a considerable agreement about how activists differ from nonactivists. The second is that the activist-nonactivist discrimination is somewhat different among men than among women. The third is that activists see their college environment differently from how nonactivists see theirs. Most of the data presented above can be summarized with reference to four dimensions.

1. Politically active students of both sexes are more welcoming of change and less interested in structure than politically inactive students. This seems to extend not only to disinterest in orderliness about personal possessions but also to a general willingness to live comfortably with ambiguity, to question external sources of authority, and to reject an authoritarian ideology.

2. Male activists differ from male nonactivists in being more friendly, open, and undefensive. They seem more persevering and dominant, less superstitious, and less given to fantasizing future achievements or to careful planning.

3. Women activists differ from women nonactivists in being more impulsive, unconventional, and rebellious, in being more interested in helping others, and less interested in conventional sorts of academic and intellectual interests.

4. Activists of both sexes differ from nonactivists in seeing their college environment as relatively richer in intellectual and interpersonal resources, but as disappointing with respect to students' passivity and unwillingness to challenge administration and faculty power.

There is a good deal in these findings that is expected and that matches both earlier research data (1, 3, 5, 6, 7, 8, 10) and certain of the popular stereotypes. This is not so true of the sex differences, however, which have so far been discussed only by Haan and her co-workers at Berkeley (3). Although her study primarily focused on the personality patterns of students at various levels of moral reasoning, Haan mentions in passing that women in the group that was most mature in terms of moral reasoning and most active politically saw themselves as more guilty, doubting, rebellious, restless, and altruistic, and less feminine, than other women in the sample. These women also saw themselves as more politically discrepant from their parents than did similarly advanced men, and they described themselves as a disappointment to their mothers whom they saw as guilt-inducing and uncomforting. While this dysphoric list does not exhaust their self-descriptions, which in many respects are positive, the descriptions overlap to some extent those obtained in this study, and the question arises as to why female activists have an edge of rebelliousness and interpersonal distance not present among male activists. The most likely explanation would seem to pivot on the incongruity between the submissive, docile aspect of the conventional female role, and the confrontive, challenging, assertive aspect of the role of the political activist. The fact that Haan's subjects believed that their mothers were disappointed in them lends support to this position, as does their self-report of being less feminine. It is not clear to what extent the female activist's political interests pushed them to give up aspects of the feminine role. An alternative possibility is that some politically interested women felt free to come to activism because of an already tenuous commitment to the submissive features of femininity, while others, equally interested politically, but more committed to these submissive aspects of conventional femininity, felt uncomfortable in expressing their political beliefs in such an active, confronting way.

A final point requiring discussion is the difference in descriptions of the college environment given by activists and nonactivists. As was mentioned above, men and women activists showed considerable agreement in differing from nonactivists in seeing their environment as rich in opportunities for friendship, for reflection, for esthetic and sensuous pursuits, and for learning, especially in the humanities and social sciences. On the other hand they found their fellow students weak, passive, and too deferential toward a faculty and administration they perceived to be arbitrary and autocratic. Their argument with "The System" seems not to be based on widespread disaffection with the university, but rather with a specific aspect of it—a perceived press for abasement and a reluctance on the part of their fellow students to challenge the university's authority. Perhaps the strike can be understood at least in part as due to the confluence of three factors: (*a*) The strike was in response to an administrative action widely perceived as arbitrary, high-handed, and unfair. (*b*) The activists have a greater need for autonomy and a lesser need for order and structure than nonactivists. (*c*) The strikers perceived the environment as demanding abasement and their fellow students as quiescent in the face of this demand. The strike can thus be seen as in part a response of those students with strong needs for a democratic distribution of power to an apparently arbitrary administrative act, set in a context of perceived administrative authoritarianism and student passivity.

E. Summary

Data collected on three personality measures was used to predict and postdict picketing behavior in a student strike. By means of conventional confidence levels, picketers were shown to be more welcoming of change and

ambiguity and less interested in order, planning, and neatness than nonpicketers. Relaxing these conventional rules of evidence reveals a pattern of sex differences in which male picketers are more open, friendly, and undefensive than male nonpicketers, while female picketers are more impulsive, heedless of their physical safety, interpersonally distant, and fearful of being controlled, than nonpicketing females. Picketers of both sexes differ from nonpicketers in perceiving their college environment as richer in opportunities for intellectual and interpersonal stimulation but also as more fraught with the twin dangers of administrative arrogance and student passivity.

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A PRELIMINARY NOTE ON THE EVALUATION OF THOSE UPON WHOM ONE DEPENDS*

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A. INTRODUCTION

The most common approach to the study of dependency is to view it as a quality of which people have differing amounts. The majority of tests that assess dependency are scored with one dimension only—the degree of dependency (e.g., 3). A very different approach to the study of dependency was suggested by Kelly (1) who argued that everyone is dependent. The important question to ask is on whom are they dependent and for what? Kelly devised a test to assess these dimensions of dependent behavior—the Situational Resources Test or RES Test (1).

The present study is the first of a series designed to investigate dependency behavior. The questions asked here concern the way in which people evaluate those upon whom they are dependent. Are these human resources liked, are they resented, are they respected, and how well known are they? These questions were investigated by means of the RES Test.

B. METHOD

The subjects were female undergraduates in an Eastern girls' college, enrolled in an Introductory Psychology course. Participation in research was a course requirement. Thirty-five girls completed the tests, but four of the test protocols were completed incorrectly and discarded. The median age of the girls was 18 years (range 17-20).

Each subject completed the RES Test. The RES Test requires the subject to list 21 significant others that she knows (for example, mother, father, minister, best friend of the same sex, and so on). The subject is asked to think of 21 different kinds of crises that she has experienced (for example, "the time when you were most depressed") and she checks each of the significant others to whom she could have turned for help during each crisis, assuming that all the significant others had been available.

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After completing the RES Test, each subject was required to rank the significant others for the degree to which she liked them, knew them, respected them, and resented them. This was done in the following manner. The subject chose the three people from the 21 significant others that she liked most; then the three she liked next most; and so on until she chose the three she liked least. The significant others were ranked similarly for the other dimensions.

C. RESULTS

In general, the subjects liked, respected, knew well, and did not resent those upon whom they were most dependent. However, these dimensions differed considerably in the strength of the association and in the number of exceptions to the pattern. For example, ideally a person should depend most on those three people liked most, be less dependent on those three people liked next most, and so on, with her depending least on the three people liked least. An example of the theoretically ideal sequence of check marks (representing the number of crises for which the three significant others in each category of "liking" would be turned to for help) is the following pattern: 26, 24, 12, 4, 0, 0, 0. An example of a pattern departing from the ideal is the following pattern: 18, 32, 18, 16, 27, 11, 27. The person who gave this pattern clearly depends upon people whom she does not like (relatively speaking). The degree of disarray in the patterns was assessed by noting the number of inversions necessary to transform a pattern into the theoretical ideal. This is similar to the computational process involved in a Kendall correlation coefficient.

The coefficients of disarray so computed were analyzed over subjects and dimensions by means of a one-way analysis of variance with repeated measures. The difference between dimensions of ranking was significant ($F = 6.80$, $df = 3, 90$, $p < .01$). A Newman-Keuls test indicated that the "resent" sort had significantly more disarray than the "like," "know best," and "respect" sorts. Thus, it appears that subjects depart more from the theoretically ideal pattern for the dimension of "resent" than for the other dimensions.

Spearman correlation coefficients were computed for each subject between her four evaluations of her significant others. The median correlation coefficients were: like/know best .81; like/respect .79; like/resent —.71; know best/respect .58; know best/resent —.51; and respect/resent —.73. (A coefficient of .37 is necessary for significance at the .05 level on a one-tailed test, and a coefficient of .52 is necessary for significance at the .01 level.)

A Friedman analysis of variance indicated that the values of the correlation coefficients differed significantly ($\chi^2 = 137.6$, $df = 5$, $p < .001$). Binomial tests indicated that the correlation coefficients differed significantly from one another except like/know best—like/respect and like/resent—respect/resent.

D. DISCUSSION

The results of this study indicate that resentment felt toward significant others is a worse predictor of dependency patterns as compared to the feelings of "like," "respect," and "know best." This means that people, in general, do resent to some extent those upon whom they are dependent. For example, the following pattern obtained from one subject for her dependency upon significant others with differing degrees of resentment—23, 46, 34, 36, 30, 21, 37—indicates a great deal of dependence by the subject upon people she resents.

In the only other published study using this theoretical approach to the study of dependency, Lester (2) found that dependency upon those whom one resents is more characteristic of suicidal students than of nonsuicidal students.

As in Lester's earlier study, a difference was found between the subjects' dependency upon those whom they like and upon those whom they resent. The subjects' liking of significant others was a better predictor of dependency than the subjects' resentment felt toward the significant others.

The present study does not allow cause-and-effect relationships to be established. Whether the resentment precedes the dependency or, alternatively, whether people come to resent those upon whom they depend is a question for future studies.

E. SUMMARY

A study of people's evaluations of those upon they depend showed that they were more likely to depend upon those whom they resented than they were to depend upon those whom they disliked, had little respect for, or did not know well. Whether the resentment is a result of the dependency or an antecedent is a question for future research.

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RELIABILITY OF DEMOGRAPHIC AND JOB RELATED INFORMATION*[1, 2]

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A. INTRODUCTION

The reliability of information obtained from biographical questionnaires is a subject of concern whenever these instruments are used in behavioral research. Despite the accessibility and increasing use of demographic and job related variables, there are limited data available on the reliability of such information (5). Since reliability is a minimum requirement for the usefulness of questionnaire data, it is necessary to give some attention to this basic measurement problem. The purpose of this report is to determine the reliability of 18 biographical items in a questionnaire that has been used in predictive studies of illness with Navy populations. The items used in this study were selected to sample important facets of prior life experience and current job situation.

Of the three primary methods generally used for estimating reliability—split-half, parallel forms, and test-retest—the latter method is generally considered to be the most meaningful (3, 4). The present test-retest study aboard an attack aircraft carrier was made possible when the ship's medical staff agreed to participate in an illness prediction study.

Several factors are known to affect test-retest measures of reliability. Among these factors are the following:

1. The length of the test-retest interval—reliability decreasing as the length of the interval increases (2);

2. The saliency or personal valence of the individual items—reliability increasing with saliency (1);

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[1] Report Number 71-39, supported by the Bureau of Medicine and Surgery, Department of the Navy, under Research Work Unit MF12.524.001-9003DF5G. Opinions expressed are those of the authors and are not to be construed as necessarily reflecting the official view or endorsement of the Department of the Navy.

[2] Grateful acknowledgment is made to Captain Earl H. Ninow, MC, USN, and to the Medical Department and crew members of the aircraft carrier *Bon Homme Richard* for their cooperation and assistance. William Pugh and Gary Lester provided valuable assistance in the data analysis.

3. Conditions of test administration—standardized, explicit instructions and items, along with a suitable testing environment, producing highe reliability;

4. The manner of scoring responses—carefully standardized scoring methods being preferable.

In the present study these factors were dealt with in the following manner:

1. *Test-Retest Interval*

A testing interval corresponding to the ship's duty tour was selected. Thus, subjects were tested with the same form at the start and upon completion of a six-month overseas cruise. This interval was considered sufficient to reduce effects due to specific memories of previous responses. However, some changes in work status, age, pay grade (rank), etc. were expected to occur within this relatively long interval.

2. *Saliency*

All of the items included in this study were considered to have high, but not equal, item saliency. It seemed reasonable that items concerning age, marital status, pay grade, etc. would have relatively high saliency for each subject. In part, this high item saliency justified the long test-retest interval.

3. *Test Administration Conditions*

The testing conditions and administration were somewhat less than optimal. This was due largely to the fact that research personnel were not present during either test administration. All of the forms were administered by the ship's medical personnel to members of the crew.

4. *Test Scoring*

All of the test forms were individually coded by experienced personnel prior to key punching for data analysis. Both the coding and the key punching were thoroughly checked for errors and missing data.

B. METHOD

1. *Subjects*

The subjects participating were 562 Navy enlisted crew members aboard an attack carrier on deployment to Southeast Asia. Approximately 45 percent of these men were aviation personnel; 80 percent were under 25 years of age; 35 percent had jobs in the engineering and hull divisions (electricians, mechanics, and firemen); and the remainder worked in miscellaneous job assignments.

2. *Procedure*

At the outset of the cruise, the 18 demographic and job related items contained in a biographical questionnaire were administered to 562 men aboard the carrier. En route to home port the items were again administered to all 562 subjects. The response formats for the items were completion or multiple choice.

Analysis of the data from the two test administrations involved comparing Test I responses to those of Test II by means of bivariate distributions to determine the frequencies of consistent and discrepant responses. This method appeared preferable to simple correlation because of the discrete nature of most of the variables.

C. RESULTS

As expected, three major patterns of item responses emerged from the analysis.

Group I (items with invariant responses) comprised five factual questions regarding marital, parental, and sibling status, region of residence, and assigned duty division.

Group II (lower stability but generally consistent responses) was made up of eight items which were predictably affected by the time interval. Age, time on active duty, and months in pay grade were classified as being consistent if the data variance was compatible with the six-month time span. Responses were also classified as consistent when the response changes were rational—i.e., changes in type of work, rate designation, or work environment.

The religious preference item, while relatively stable, showed an 11 percent variation in responses on retest, which perhaps is to be expected in a youthful population recently separated from their home environments.

Group III contained five items which were found to be low not only in stability but in completeness of response as well. In this study it was apparent that many subjects had no certain knowledge of recruit examination scores (General Classification Test), parents' occupations, or parents' educational levels. When confronted with questions relevant to these topics, subjects apparently guessed or failed to respond. Responses to questions concerning number of dependents, years of schooling completed, etc. showed discrepancies that indicated some misinterpretation of instructions.

Two items in Group III showed a relatively high rate of missing data. For

GCT, this was a simple lack of information. However, the missing data for father's occupation was due partly to incomplete coverage in the multiple choice alternatives provided.

TABLE 1
PERCENTAGE OF AGREEMENT IN TEST-RETEST RESPONSES

Data categories	% Invariant	% Consistent	% Discrepant	Total no. responses	% Missing data[a]
Group I					
Marital status	97.0	—	2.5	558	.7
Region grew up	93.6	—	6.4	546	2.8
Birth order	95.0	1.6	3.4	502	10.7
Parents' status	95.9	1.3	2.9	555	1.2
Division	92.5	7.5	—	531	5.5
Mean	94.8	2.1	3.0		4.2
Group II					
Rate group	86.6	13.4	—	528	6.0
Pay grade	62.1	37.3	.5	552	1.8
Duty time	39.7	56.3	4.0	549	2.3
Duty type	80.0	20.1	—	533	5.2
Age	49.4	49.2	1.3	524	6.8
Religion	89.4	—	10.5	550	2.1
No. worked closely with	72.5	27.5	—	556	1.1
Number supervised	64.6	35.4	—	525	6.6
Mean	68.0	31.2	.7		4.0
Group III					
Father's occupation	76.6	—	23.4	414	26.3
Father's education	76.7	—	23.3	524	6.8
Number of dependents	77.9	6.8	15.2	526	6.4
Education	87.8	—	12.2	551	2.0
GCT score	86.5	—	13.5	319	43.2
Mean	81.1	1.4	17.5		16.9

[a] Based on *N* of 562.

When Groups I and II are combined, it can be seen that the items classified as invariant and consistent had an overall mean discrepancy rate of 1.6 percent. This figure, compared to the 18.5 percent mean discrepancy rate for the items in Group III, clearly indicated a difference in the quality of the information reported.

D. DISCUSSION

This study has explored the agreement in test-retest measures as a means of determining the reliability of biographical and environmental data obtained from questionnaires. Results indicated that these data showed a high degree of reliability, with an overall response consistency of 94 percent. Although the discrepancy range was from zero percent to 24 percent, less than half of the items showed discrepancies greater than 3 percent. Reliability of the data appeared to be contingent, to some extent, upon the content of the questionnaire items.

E. SUMMARY

The reliability of information obtained from questionnaires is a basic requirement for evaluating the usefulness of these data as behavior predictors. The purpose of this study was to determine the reliability of biographical and job situation items by means of test-retest measures.

At the outset of a cruise and en route to home port six months later, the items were administered to 562 Navy enlisted men aboard an attack aircraft carrier.

A bivariate matching of responses resulted in three major response patterns: Group I, items having a high stability of consistency of response; Group II, high consistency items with plausible changes; and Group III, items with discrepant responses. Generally these items manifested high consistency.

It is concluded that even though a relatively long testing interval was employed and testing conditions were less than optimal, the reliabilities of almost all of the biographical and situational items were sufficiently high to justify their inclusion in predictive studies.

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[illegible] sample). Results indicated that these data showed a high degree of reliability, with an overall response consistency of 94 percent. Although the discrepancy range was from zero percent to 20 percent, less than half of the items showed discrepancies greater than 3 percent. Reliability of the data appeared to be [illegible] to some extent upon the content of the questionnaire items.

IV. SUMMARY

The reliability of information obtained from questionnaires is a basic requirement for evaluating the usefulness of such data as behavior predictors. The purpose of this study was to determine the reliability of biographical and situational items by means of test-retest procedures.

At the outset of a cruise and on return to home port six months later, the items were administered to 182 Navy enlisted men aboard an attack aircraft carrier.

A [illegible] matching of responses resulted in three major response patterns: Group I, items having a high stability or consistency of response; Group II, high consistency items with plausible changes; and Group III, items with discrepant responses. Generally these items contained high [illegible]

It is concluded that even though a relatively long testing interval was employed and testing conditions were less than optimal, the reliabilities of almost all of the biographical and situational items were sufficiently high to justify their inclusion in predictive studies.

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INFLUENCE OF AGE, SEX, AND *IQ* DIFFERENCES ON BEHAVIOR OF PROFOUND RETARDATES AS MEASURED BY THE RATING SCALE TECHNIQUE*[1]

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A. INTRODUCTION

Now that community educational and training services are more readily available to mildly and moderately mentally retarded individuals, many residential centers are focusing their attention on the increasing proportion of severely and profoundly retarded children and adults entrusted to their care (13). To understand these handicapped persons better, professional workers are re-examining the accumulated literature and more closely observing the behavior of their residential populations. The writings of such pioneers as Itard (5), Seguin (10), and Montessori (8) are studied along with the more recent works of Kolburne (6), Penny (9), Groves and Carroccio (3), Hollis and Gorton (4), Wilson and Parks (14), and the SREB Recreation Committee (12). To assist in their observation of individual behavior, many are using a variety of measuring instruments, including carefully prepared rating scales, such as those published by the American Association on Mental Deficiency (1) and the American Guidance Service (2).

The effectiveness of a behavior rating scale in evaluating improvement of ambulatory mentally retarded patients undergoing operant conditioning training has been demonstrated by William C. Snauffer (11). In his longitudinal study of profoundly and severely retarded institutionalized females, a Resident Rating Scale compiled by his colleague, Mrs. Sally Baskin Thomas, was utilized. Each subject's degree of self-sufficiency in toileting, grooming, feeding, communication, recreation, and socialization was examined by the instrument.

The present writers made further use of the scale when several senior undergraduate psychology majors at Susquehanna University became interested in observing the behavior patterns of profoundly retarded children and adults

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residing at the nearby Selinsgrove State School and Hospital, an institution caring for 1800 patients with varying degrees of mental deficit. Weekly visits to the wards were started in February, 1968, with the intention of getting to know the "brighter" school-age children first. To accomplish this, the range of profound retardation was arbitrarily divided into four *IQ* groups: 15-19, 10-14, 5-9, and 0-4. Intelligence quotients were readily attainable from the files of the eight-member psychology department.

Over a period of five semesters, cumulative records written by psychology majors included behavior descriptions of many children, as well as a number of young adults, covering the entire 0-19 *IQ* span. A subsequent cursory review of individual total scores obtained on the Resident Rating Scale revealed what appeared to be three interesting cross-sectional differences among the patients: a marked tendency toward higher Rating Scale scores with advancing *IQ*, as well as with chronological age (*CA*), and a slight tendency toward higher scores for the females. These "findings" suggested the intriguing possibility that a random sampling of the institution's population of ambulatory profound retardates would disclose statistically significant differences of behavior when *only* the factors of *IQ*, chronological age, and sex were considered. The present study was designed to investigate the impact of these three factors more rigorously, again with the help of a rating scale.

B. METHOD

1. *Procedure*

Each subject was rated by an experienced employee of the Nursing Department. Nurses and psychiatric aides had demonstrated their ability as evaluators in the Snauffer study (11) of 1967-68. For the present study, the Resident Rating Scale was revised to incorporate ideas offered by college students, ward personnel, and the professional literature. The new mimeographed version, renamed as the *Selinsgrove State School and Hospital Resident Rating Scale* (Appendices A and B), provides for a maximum total score of 154 points and a minimum of 30 points. The reliability of the instrument was estimated when 10 percent of the subjects in the study were re-evaluated by ward personnel after an interval of from two to four weeks. A Pearson product-moment coefficient of reliability of .95 was obtained.

2. *Research Design*

Effect of the three variables (age, *IQ*, and sex) upon behavior, as reflected by total scores on the rating scale, was determined by the analysis of variance technique. The $p \times q \times r$ factorial design having n observations per cell, described by Winer (15), was utilized for three separate analyses of variance. Two analyses required the 2 × 2 × 2 design with eight cells containing 10 observations (i.e., 10 individual total rating scale scores) per cell. The eight cells represented subdivisions of the three independent variables, including (*a*) Age, represented by subjects who were either in the 10-0 (10 years, zero months) to 19-11 *CA* range or the 20-0 to 29-11 range; (*b*) Sex; and (*c*) *IQ* subdivisions consisting of two nonadjacent levels—in one case the 0-4 and 10-14 levels, in the other case the 5-9 and 15-19 *IQ* levels. The procedure of interspersing levels provides sufficient intervals between groups to minimize the possible confounding of results by overlapping *IQ* scores due to the probable-error factor. The third analysis of variance, requiring a 2 × 4 × 2 factorial design, included all four *IQ* levels, offering an opportunity to inspect for marked changes in degree of significance when contrasted with the findings of the other two analyses.

3. *Subjects*

*S*s were 154 (80 male and 74 female) ambulatory institutional residents with intelligence quotients within the range of profound mental retardation—namely, *IQ*s of less than 20 as derived, in this study, by use of the Stanford-Binet and Cattell intelligence scales, instruments that supplement each other along the mental age continuum. All *S*s had been residents of the institution for at least one year prior to the present cross-sectional study. Almost everyone had received, since the data of admission, at least two psychological examinations with a consistency of results indicating extreme mental handicap.

With a known pool of roughly 500 prospects, it was expected that the ideal distribution of 160 subjects could be obtained by a random sampling of those meeting the age, sex, and *IQ* requirements. Actually, a great surplus of residents with *IQ*s of 5 and above made the random-sampling procedure an appropriate one at that echelon. However, *ambulatory* patients with *IQ*s *below* 5 are relatively scarce, it seems. Of 132 residents having the qualifying *CA* and *IQ*, only 34 (distributed as shown in Table 1) were completely

TABLE 1
ACTUAL FREQUENCY DISTRIBUTION OF AMBULATORY SUBJECTS

	CA 10-0 to 19-11		*CA* 20-0 to 29-11		
IQ level	Male	Female	Male	Female	Total
0-4	10	6	10	8	34
5-9	10	10	10	10	40
10-14	10	10	10	10	40
15-19	10	10	10	10	40
Total	40	36	40	38	154

ambulatory. Thus, instead of the 20 females desired for this *IQ* level, 14 were studied—enough, fortunately, to permit a research design that would be valid for statistical interpretation of results. An acceptable method of adjustment is that recommended by Lindquist (7, p. 148).

C. Results

1. *Comparison of the 0-4 and 10-14* IQ *Groups*

Data pertaining to the dependent variable, as measured by total scores on the Resident Rating Scale, were arranged in a 2 × 2 × 2 factorial analysis of variance design. This analysis indicated significant effects attributable to Age ($F = 23.17$, $df = 1/66$, $p < .0005$); *IQ* level ($F = 43.18$, $df = 1/66$, $p < .0005$); and Sex ($F = 4.64$, $df = 1/66$, $p < .05$). Interactions between the independent variables were all nonsignificant ($F\text{s} \leqslant 1.20$, $df = 1/66$, $p\text{s} > .25$).

2. *Comparison of the 5-9 and 15-19* IQ *Groups*

The second analysis of variance based upon data within a 2 × 2 × 2 design attributed effects of significance only to the factors of Age ($F = 14.12$, $df = 1/72$, $p < .0005$) and *IQ* level ($F = 109.67$, $df = 1/72$, $p < .0005$). The rating scale scores were *not* influenced significantly by Sex ($F = .04$, $df = 1/72$, $p > .25$). Interactions between the independent variables were all nonsignificant ($F\text{s} < 1.0$, $df = 1/72$, $p\text{s} > .25$).

3. *Comparison of Four Adjacent* IQ *Groups*

For the third analysis of variance, dependent variable data were arranged in a 2 × 4 × 2 factorial design (Table 2). Two of the three independent variables were apparently again highly significant: Age ($F = 37.03$, $df = 1/138$, $p < .0005$) and IQ level ($F = 61.66$, $df = 3/138$, $p < .0005$). The influence of Sex was nonsignificant ($F = 2.04$, $df = 1/138$, $p > .10$). Interactions between the independent variables were all nonsignificant ($F\text{s} \leqslant 1.43$, $df = 3/138$, $p\text{s} > .10$).

TABLE 2
MEAN TOTAL SCORES ON THE BEHAVIOR RATING SCALE

IQ level	*CA* 10-0 to 19-11		*CA* 20-0 to 29-11		Combined males	Combined females
	Male	Female	Male	Female		
0-4	55.7	61.2	75.8	80.5	65.8	72.2
5-9	74.8	70.0	84.8	82.2	79.8	76.1
10-14	74.9	95.5	102.2	106.0	88.6	100.8
15-19	107.2	110.9	126.2	126.9	116.7	118.9

TABLE 3
RANGE OF TOTAL SCORES ON THE BEHAVIOR RATING SCALE

	CA 10-0 to 19-11		*CA* 20-0 to 29-11	
IQ level	Male	Female	Male	Female
0-4	53-61	54-70	57-119	62-109
5-9	51-100	49-113	51-109	60-104
10-14	54-120	45[a]-124	57-129	80-127
15-19	78-139	78-131	83-152	112-149

[a] Example of unusually low score contributed by an emotionally disturbed patient. No attempt was made to screen out *any* types other than the nonambulatory.

Tables 2, 3, and 4 give visible evidence of the extent of difference stemming from *IQ* and the other independent variables. In Table 2 the inconsistency of superiority of female scores is obvious, resulting in the elimination of the Sex factor as a statistically significant variable. Table 3 discloses the wide range of individual total scores at each *IQ* level. As a consequence, there is appreciable overlap of scores when one level is compared with another. Certain individuals perform remarkably well for their age and *IQ*, while others have disappointingly low scores. As indicated in the footnote to Table 3, no attempt was made in the selective process to screen for emotional disturbance or any attribute other than *ambulation*. Table 4 serves to illustrate the relative potency of the 32 items on the scale. Obviously, certain items fail to discriminate in this cross-sectional study. However, each item is considered by ward personnel and the writers to be of importance in understanding individual patients, especially when conducting longitudinal studies.

D. DISCUSSION

The *Selinsgrove State School and Hospital Resident Rating Scale*, or an equivalent instrument of this nature, could be of help to institutional personnel who serve the extremely retarded. Snauffer (11) has already demonstrated how even slight improvement in certain areas of behavior can be detected over a period of time when such a device is employed. An analysis of rating scale data of the present cross-sectional study suggests that improvement in behavior tends to occur as residents move on from the adolescent period into the first decade of early adulthood, and that persons with progressively higher *IQ*s within the range of profound mental retardation should, in general, be expected to manifest higher levels of overall behavioral performance. Results of the present study contradict any assumption that females *or* males will consistently tend to earn higher rating scale scores on an instrument of this type.

TABLE 4
MEAN SCORE PER BEHAVIOR RATING SCALE ITEM FOR EACH AGE, SEX, AND *IQ* GROUP[a]

Item	*IQ* 0-4				*IQ* 5-9			
	CA 10-19		CA 20-29		CA 10-19		CA 20-29	
	Male	Female	Male	Female	Male	Female	Male	Female
Toileting								
1.	1.0	1.2	1.9	2.0	2.6	1.6	2.9	4.2
2.	1.0	1.2	1.9	2.0	2.5	1.6	3.1	4.1
3.	1.0	2.0	2.9	3.6	3.1	1.7	3.9	3.5
4.	1.1	1.2	2.1	2.3	2.5	1.8	3.3	2.8
5.	4.1	4.7	4.9	4.0	4.3	4.0	4.2	4.2
Grooming								
1.	2.0	1.8	2.1	2.1	2.2	2.0	2.0	1.9
2.	2.0	1.8	2.2	2.1	2.0	2.0	1.9	1.9
3.	1.9	2.0	1.9	2.1	2.2	2.0	2.2	1.9
4.	2.0	2.0	2.0	2.0	2.0	2.1	2.0	1.9
5.	1.8	1.7	3.0	3.0	3.1	2.5	3.7	2.5
6.	4.3	5.0	3.7	3.6	3.1	3.3	3.6	4.3
7.	1.9	2.0	2.8	3.1	2.7	2.7	3.0	2.3
8.	1.0	1.0	1.1	1.5	1.3	1.2	2.0	1.6
9.	1.0	1.0	1.1	1.4	1.2	1.2	1.5	1.5
Feeding								
1.	1.2	1.7	2.9	3.4	3.2	2.8	3.4	3.2
2.	1.8	2.7	4.3	5.0	4.2	4.1	4.5	4.3
3.	1.6	1.8	2.0	2.0	2.5	2.5	2.1	2.2
4.	1.2	2.0	2.8	3.1	2.9	2.4	3.4	3.1
5.	1.0	1.2	2.0	1.5	2.2	1.4	3.5	1.6
Communication								
1.	1.5	2.0	2.1	2.6	2.2	2.6	2.7	2.2
2.	1.0	1.5	1.4	1.8	1.3	1.7	2.2	2.1
3.	1.4	1.8	3.4	3.5	3.2	2.1	3.2	3.7
4.	1.8	1.3	2.5	2.8	2.0	2.7	2.7	2.4
5.	.0	.0	.1	.5	.0	.4	.5	.2
6.	.0	.0	.0	.3	.0	.2	.0	.2
Play								
1.	1.5	1.7	2.0	2.4	2.2	2.5	2.8	1.8
2.	1.0	1.0	1.3	1.4	1.5	1.7	1.2	1.3
3.	1.1	1.0	1.5	1.9	1.3	1.8	1.3	1.4
4.	2.5	2.3	2.2	2.3	2.5	2.7	2.3	2.3
General								
1.	1.8	1.3	2.1	2.8	2.1	1.9	2.1	2.5
2.	5.0	5.0	4.9	4.5	4.3	4.4	3.4	4.5
3.	4.2	4.3	4.6	4.1	4.3	3.1	4.6	4.6

TABLE 4 (*cont.*)

Item	*IQ* 10-14				*IQ* 15-19			
	CA 10-19		CA 20-29		CA 10-19		CA 20-29	
	Male	Female	Male	Female	Male	Female	Male	Female
Toileting								
1.	1.6	3.5	3.9	4.2	4.2	4.2	4.6	4.8
2.	1.9	3.4	4.0	4.2	4.3	3.9	4.8	4.4
3.	2.6	3.2	4.2	3.8	4.0	4.2	4.3	4.6
4.	2.0	3.1	4.2	4.7	4.6	4.3	5.0	5.0
5.	3.9	4.6	4.0	4.0	4.7	4.7	4.6	4.7
Grooming								
1.	1.9	2.5	2.3	2.4	2.7	2.6	3.4	3.5
2.	2.3	2.6	2.8	2.8	2.8	2.8	3.9	3.9
3.	2.0	2.6	3.1	3.0	2.5	2.6	3.8	3.9
4.	2.1	2.3	2.7	2.8	2.7	2.5	3.4	3.5
5.	2.9	2.9	4.0	3.4	3.3	2.9	4.4	4.2
6.	3.3	4.3	3.7	3.8	4.0	5.0	4.0	4.4
7.	2.5	3.3	3.5	3.6	3.0	2.7	4.3	3.9
8.	1.7	1.9	3.1	1.8	2.7	2.3	4.1	3.1
9.	1.8	1.8	1.9	1.7	2.5	2.9	3.4	3.0
Feeding								
1.	3.3	3.5	4.2	3.9	4.0	4.0	4.4	4.3
2.	4.5	4.6	5.0	5.0	5.0	5.0	5.0	5.0
3.	2.9	2.7	2.9	2.4	2.9	2.6	3.0	3.2
4.	2.9	3.5	4.6	3.8	4.3	3.7	4.7	4.8
5.	2.2	3.1	5.0	3.7	4.7	3.3	5.0	4.8
Communication								
1.	2.6	3.3	2.6	3.3	2.9	3.5	3.3	3.8
2.	2.4	3.2	1.8	4.3	3.2	4.3	3.8	4.3
3.	2.7	3.9	3.5	3.8	3.6	4.1	4.6	4.6
4.	1.7	2.9	2.2	3.7	3.8	4.0	4.5	4.3
5.	.0	1.1	.5	2.6	1.1	2.7	3.5	3.8
6.	.0	.5	.2	1.2	.3	1.5	2.1	1.9
Play								
1.	2.7	3.2	3.4	3.0	3.9	4.3	4.1	4.3
2.	1.6	2.4	2.9	2.2	3.1	3.0	3.3	3.6
3.	1.7	2.2	2.3	2.3	3.1	2.6	3.0	3.2
4.	2.6	3.0	2.6	3.1	3.2	3.3	3.3	3.6
General								
1.	2.3	2.6	2.1	2.5	2.2	2.9	2.6	2.8
2.	2.7	4.2	4.2	4.7	3.4	4.4	4.3	3.8
3.	3.7	3.6	3.9	4.3	4.5	4.6	4.4	4.1

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[a] For each category of subjects $n = 10$, except under *IQ* 0-4, where for females of *CA* 10-19, $n = 6$, and for females of *CA* 20-29, $n = 8$ (see Table 1).

E. SUMMARY

Behavioral characteristics of 80 male and 74 female profoundly retarded but ambulatory institutional residents were investigated by means of a rating scale administered by ward personnel. The scale was designed to evaluate each subject's degree of self-sufficiency in toileting, grooming, feeding, communication, recreation, and socialization. Data concerning *S*s ranging in age from 10 to 29 years were distributed within a factorial design having Age, *IQ*, and Sex as independent variables, and total score on the rating scale as the dependent variable. Statistical analyses of variance revealed that the factors of chronological age and *IQ* tend to be consistently significant in affecting the residents' behavior, whereas, on the basis of the present study, influence of the sex factor appears to be unimportant.

APPENDIX A

SELINSGROVE STATE SCHOOL AND HOSPITAL

RESIDENT RATING SCALE

Name of resident————————; Date————; Name of evaluator ————————; Resident's height and weight————.

Preliminary question (Circle NO or YES). Does the child have a physical condition which limits his activities? NO YES What is it?————————

DIRECTIONS: Read each question and circle the number of the one response which *best* describes the child's behavior. Scoring is determined by adding the numbers circled. The higher the number the more acceptable the behavior. Maximum score possible for the scale is 154; the minimum score is 30.

TOILET BEHAVIOR

1. How often does the child soil himself? 1) Almost daily; 2) About once a week; 3) About once a month; 4) Less than once a month; 5) Never.

2. How often does the child urinate in his pants during the day? 1) Almost daily; 2) About once a week; 3) About once a month; 4) Less than once a month; 5) Never.

3. How often does the child wet the bed at night? 1) Almost daily; 2) About once a week; 3) About once a month; 4) Less than once a month; 5) Never.

4. How does the child indicate his toilet needs? 1) Doesn't; 2) Doesn't indicate but will use toilet if taken on regular schedule; 3) Will indicate non-verbally then must be taken; 4) Will indicate verbally then must be taken; 5) Will go by self.

5. Does the child smear or play with B. M.? 1) Almost daily; 2) About once a week; 3) About once a month; 4) Less than once a month; 5) Never.

GROOMING BEHAVIOR

1. What routine is necessary at bath time? 1) Resistive; 2) Child must be bathed, non-resistive; 3) Child needs assistance but will help; 4) Needs supervision but will bathe self; 5) Can bathe self without assistance or supervision.

2. What routine is necessary to wash the child's hands and face? 1) Resistive; 2) Child must be washed, non-resistive; 3) Child needs assistance but will help; 4) Needs supervision but will wash self; 5) Child can wash with out assistance or supervision.

3. What routine is necessary to brush the child's teeth? 1) Resistive; 2) Child must have teeth brushed, is non-resistive 3) Child needs assistance but will help; 4) Needs supervision but can do the task; 5) Child can brush without assistance or supervision.

4. What routine is necessary to comb the child's hair? 1) Resistive; 2) Child must have hair combed, is non-resistive; 3) Child needs assistance but will help; 4) Child needs supervision but can do the task; 5) Child can comb hair without assistance or supervision.

5. How skilled is child at undressing when told to do so by attendant? 1) Resistive; 2) Needs to be undressed, non-resistive; 3) Needs assistance but will try to help; 4) Needs supervision but can undress by self; 5) Can undress without assistance or supervision.

6. How often does inappropriate disrobing occur? 1) Almost daily; 2) About once a week; 3) About once a month; 4) Less than once a month; 5) Never.

7. How skilled is the child at dressing self? 1) Resistive; 2) Child must be dressed, is non-resistive; 3) Needs assistance but will try to help; 4) Needs supervision but can dress self; 5) Can dress without assistance or supervision.

8. How skilled is the child at buttoning clothing? 1) No comprehension of need for buttoning; 2) Indicates need for buttoning; 3) Can button clothes but is very slow; 4) Buttons at times but inconsistently; 5) Can button clothes skillfully.

9. How skilled is the child at tying shoelaces? 1) Gives no indication they should be tied; 2) Indicates need for tying; 3) Laces but does not tie; 4) Laces and ties knots; 5) Can tie shoe laces skillfully, forming a bow.

10. Girls only (NOT to be included in the rating scale score. Circle the appropriate alphabetical letter.) A) Doesn't menstruate; B) Will not keep

pad on; C) Will keep a pad on if it is placed on by attendant; D) Can indicate a need for pad; E) Can care for self during period.

FEEDING BEHAVIOR

1. How skilled is the child at feeding self? 1) Must be fed; 2) Can feed self with fingers; 3) Uses fingers and spoon indiscriminately; 4) Uses spoon well; 5) Uses spoon and fork.
2. How skilled is the child at drinking from a cup or glass? 1) Must have trainers cup held; 2) Regular cup but held; 3) Needs occasional help in drinking; 4) Trainer cup unassisted; 5) Regular cup or glass unassisted.
3. What type of food tray does the resident receive? 1) Puree; 2) Chopped; 3) Regular.
4. How advanced is the child in dining room self-care? 1) Must be fed on ward; 2) Feeds self but on ward unit; 3) Goes to dining room but is is served a tray; 4) Goes to dining room but needs assistance in cafeteria line; 5) Goes through cafeteria line unassisted.
5. Can the child make use of the drinking fountain on the ward? 1) Shows no interest in getting a drink; 2) Will come for a drink if others are getting one; 3) Will initiate need by indicating to others; 4) Will operate the fountain with directions from others; 5) Will operate the fountain independently.

COMMUNICATION

1. How appropriate are the child's smiles? 1) Child never smiles; 2) Smiles but not to appropriate stimuli; 3) Smiles occasionally to appropriate stimuli; 4) Smiles usually to appropriate stimuli.
2. In what way is non-verbal communication present? 1) Not used; 2) Imitative (such as patty-cake); 3) Non-verbal simple social skills (such as shaking hands); 4) Indicates simple needs by gesturing; 5) Relates experiences non-verbally (such as showing letters received).
3. How does the child respond to simple verbal directions? (Examples: "Come." "Sit." "Stop.") 1) Doesn't respond; 2) Responds with tantrum behavior; 3) Occasionally does as told; 4) Often does as told; 5) Usually does as told.
4. In what form is the child's verbalization present? 1) No sounds; 2) Screams, grunts, etc.; 3) Babbling; 4) Attempts to form words but inadequately; 5) Comprehensible speech.
5. In what form is speech present? (Omit in scoring if 4 or 5 in #4 above was not credited.) 1) Words of one syllable (such as "Hi," "Bye," "No");

2) Single words containing more than one syllable; 3) Word combinations (two words meaningfully together); 4) Simple comprehensible phrases; 5) Simple meaningful sentences.

6. How is speech used? (Omit in scoring if 4 or 5 in #4 above was not credited.) 1) Names objects and persons; 2) Indicates simple needs; 3) Relates experiences and carries on conversation.

PLAY ACTIVITY

1. What is the child's reaction when given a toy? 1) Pays no attention to it; 2) Will hold it for brief period and drop; 3) Will inspect it briefly; 4) Handles toys for a long period; 5) Will actually play with it or manipulate it appropriately.

2. Will the child participate in circle games? 1) Won't; 2) With much supervision and prodding; 3) With limited encouragement and help; 4) Does when told to; 5) Initiates this type of play.

3. What is the child's typical level of play? 1) No attempt to play; 2) "Solitary play" (able to play alone or in self-contained fashion); 3) "Parallel play" (comfort in side-by-side presence of another child, but no real interaction; may be doing different things at same time); 4) "Associative play" (all children doing the same thing but separately, without social interaction); 5) "Cooperative play" (sharing things; taking turns; "playing house" together with individual roles).

4. What is the extent of participation in institutional recreational activities? 1) Participates only in ward activities; 2) Participates in passive activities such as bus rides or Go-Mobile; 3) Goes for walks or to the playground; 4) Spectator activities in the auditorium; 5) Actually participates in activities such as dances, game nights, skating.

GENERAL BEHAVIOR

1. How does the child *typically* respond to environmental changes? 1) Resists any change; 2) Passively accepts most changes initiated by others; 3) Shows enthusiasm for certain changes of scene (such as mealtime, visitation, going for a walk); 4) Initiates activities resulting in change in environment.

2. How often is the child abusive to other residents? 1) Almost daily; 2) About once a week; 3) About once a month; 4) Less than once a month; 5) Never.

3. How often is the child abusive to self? 1) Almost daily; 2) About once a week; 3) About once a month; 4) Less than once a month; 5) Never.

APPENDIX B

SELINSGROVE STATE SCHOOL AND HOSPITAL

RESIDENT RATING SCALE (Supplemental Sheet)

1. What institutional programs does the resident participate in? ______

2. Does this person have visitors? ______

3. Does he go home or elsewhere for vacations? ______

4. Is the resident a seizure patient? (If so, what kind of seizure medication is taken?) ______

5. Is the resident on *any* medication other than seizure medication? (If so, what is the medication's purpose?) ______

6. Does the resident seem at any time to know right from wrong? If he *does,* please give an example of his behavior where he showed this ability to distinguish right from wrong. ______

7. After looking this questionnaire over, is there anything outstanding about the resident we have overlooked (typical disposition; unusual ability; smarter than the others; different from others in certain ways; strong desire to be with employees; a real helper on the unit; etc.)? ______

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A COMPARISON OF TWO APPROACHES TO THE ANALYSIS OF PERSONALITY DIFFERENCES*

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A. INTRODUCTION

Considerable research has been devoted to delineating personality differences between particular groups (2, 3, 4). Such studies have typically involved applying some standardized personality instrument to both groups and comparing mean scores for each personality trait. While such comparisons may be useful in indicating gross differences between groups, a good deal of information about personality differences could be lost or concealed through the summing of trait scores across subjects. More importantly, comparisons of trait scores provide little or no information about the interrelationships among traits or about the personality *structures* characterizing the groups. Therefore, since techniques for simultaneously examining the relationships among traits and between group configurations or structures are readily available, the purpose of this study was to execute a comparative analysis of two groups on the basis of personality. Specifically, the intent was to indicate the richer information provided by factor analysis and comparison of factor structures, in contrast with a simple comparison of group means.

B. METHOD

1. *Design*

The two groups selected for analysis were males and females. The principal criterion for the use of these two groups was that definite personality differences were extremely likely (10). The Edwards Personal Preference Schedule (EPPS) was administered to both groups. The EPPS was selected because of the comprehensiveness of the theory upon which it was based (7) and because of its relative ease of interpretation. Since no normative inferences were involved, the ipsative nature of the EPPS was not an important consideration.

The analysis was twofold. First, mean scores obtained by each group on

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the 15 EPPS variables were compared. Then the scores obtained by each group were independently factored, and the factor structures were compared to discover more precisely differences in personality structures between the groups.

2. *Subjects*

*S*s were 196 adults, 108 of whom were females. Seventy percent were married; age ranged from 19 to 74 with a median of 28 years. None of the subjects were students at the time of the study.

C. Results

The initial step in the analysis was to replicate the typical comparison of trait scores for each group. This was performed by utilizing the standard two-sample t test. The result of this comparison is presented in Table 1.

TABLE 1
Differences Among Personality Traits Between Females and Males

	Means			
EPPS variables	Female	Male	Difference between means	t
Achievement	13.9	15.5	1.6	2.6**
Deference	11.4	11.3	.1	.1
Order	12.1	11.5	.6	.8
Exhibition	13.5	14.4	.9	1.5
Autonomy	13.3	15.6	2.3	3.7**
Affilation	17.1	13.6	3.5	6.3**
Intraception	15.9	15.3	.6	.9
Succorance	12.5	10.8	1.7	2.7**
Dominance	12.4	17.5	5.1	7.3**
Abasement	14.1	11.7	2.4	3.3**
Nurturance	16.5	13.4	3.1	4.8**
Change	17.3	15.0	2.3	3.5**
Endurance	13.0	13.7	.7	1.0
Heterosexuality	13.5	16.8	3.3	3.6**
Aggression	12.0	13.3	1.3	2.0*

* $p > .05$.
** $p > .01$.

Significant differences between males and females were found for 10 of the 15 personality scales or needs measured by the EPPS. Only one of the 10 significant differences, aggression, was not significant at the .01 level. Thus males and females appeared to be dramatically different in most respects.

To understand the personality differences between the two groups further, personality scores for each group were factor analyzed. Five orthogonal factors possessing eigenvalues greater than 1.00 were extracted from each correlation matrix and rotated to simple structure with use of the varimax criterion (5).

Table 2 contains the factor loading matrices for each of the groups. Because

TABLE 2
ROTATED FACTOR MATRICES FOR FEMALES (F) AND MALES (M)

	Factor loadings									
	I		II		III		IV		V	
EPPS variables	F	M	F	M	F	M	F	M	F	M
Achievement	—.5677	—.6429	.0661	.1628	—.1260	.1802	—.3435	—.1794	—.2808	—.0670
Deference	.1801	.3172	.6236	—.6074	.0205	.2816	.1520	.2327	—.1476	.0282
Order	—.0089	—.0497	.7191	—.2542	.1100	.6664	.0534	—.0226	—.0217	.0011
Exhibition	—.6391	—.6921	—.3098	.1787	.0079	—.3152	—.1093	.1869	—.0411	—.1520
Autonomy	—.1742	—.0096	—.3686	.4590	.2785	—.2377	—.4402	—.0718	.1091	.5653
Affiliation	.1508	—.1145	—.0252	—.1447	.0279	—.3483	.8152	.7564	—.0223	—.0198
Intraception	.1303	.1489	—.0740	—.1660	.0815	.0277	.0716	.0041	.9308	.8178
Succorance	.5079	.4388	—.3735	.1813	.3798	—.0041	.3231	.2965	—.1756	—.5243
Dominance	—.8192	—.6080	—.1593	—.0702	.9020	—.1150	—.0747	—.0236	—.0616	—.2022
Abasement	.3347	.7230	.6115	—.0846	.1409	.0721	.1477	—.0227	.1139	—.2858
Nurturance	.2446	.5942	—.0482	—.1269	.3814	—.1304	.6779	.4971	.0041	—.3022
Change	—.0775	—.0319	—.0761	.0209	—.8250	—.5178	.0722	—.5514	—.0271	.3035
Endurance	.0158	.1187	.7117	—.0451	—.1923	.8209	—.2528	—.0486	—.0066	.0103
Heterosexuality	.2901	—.2997	—.5848	—.2177	—.5553	—.3914	—.1876	—.6681	—.1381	—.0810
Aggression	—.0849	—.0526	—.1614	.8211	.2313	—.0481	—.6208	.0752	—.2816	—.1111

of the inherent subjectivity involved in labeling factor axes, no attempt was made to identify the factor structures. Instead, the factor structures were empirically compared to determine if configural invariance existed. Configural invariance exists between two samples if factor identities are fundamentally the same (9).

The comparison was performed by means of the technique of transformation analysis developed by Ahmavaara (1), extended by Kaiser (6), and programmed by Veldman (11). Transformation analysis is merely a method to compare or match factor structures obtained from two samples from different populations tested over the same variables. In the technique one factor matrix is arbitrarily selected as a reference matrix, and the other matrix is rotated so as to conform as closely as possible to the reference matrix. In this application the result was maximally contiguous personality structures.

Indices of how well the two structures match are factor invariance coefficients; these are based upon the cosines of the angles between the factor axes and are interpreted as analogous to correlation coefficients. Coefficient values ± .70 or smaller usually indicated a lack of similarity between factors in the matrices. Coefficients of ± .90 or greater indicated substantial correspondence and virtual structural identity (8).

Table 3 presents the cosines of the transformation analysis. Strict comparison of the factor matrices involves investigating only the main diagonal of coefficients. However, the approach followed here was to investigate all coefficients under the assumption that order of extraction may differ somewhat for the two samples despite virtual structural agreement. Hence order of extraction should not be the prime determinant as to whether or not there was configural invariance.

TABLE 3
COSINES AMONG FACTOR AXES

Female factors	Male factors I	II	III	IV	V
I	.9563	.0590	—.0963	—.2453	—.1119
II	.1159	—.4335	.8933	.0084	—.0259
III	.1791	.5646	.2419	.7663	—.0598
IV	.1230	—.6842	—.3606	.5698	—.2490
V	.1576	—.1472	—.0657	.1672	.9598

Two coefficients were greater than .90, the value required for structural identity. The five "best fits" produced invariance coefficients of .96, .96, .89, .78, and —.68. Thus there were two cases of structural identity, two cases of marginal identity, and one instance of lack of similarity between factors.

D. DISCUSSION

The results of the two analyses provided quite different views of the extent and nature of personality differences between males and females. The comparison of trait means indicated rather vast differences between the two groups, two-thirds of the means being significantly different. On the other hand, the comparison of factor structures indicated considerable similarity between the two groups; two of the five factors were virtually identical, two were marginally identical, and there was only one instance of lack of similarity. According to the factor structure analysis, the two groups differed on the basis of the factors that did not match: IV for females and II for males. These factors contained the personality traits idiosyncratic to their respective groups.

A reasonable question would be the extent to which the significant mean differences are reflected in the idiosyncratic factors. With adoption of a factor loading of .25 as an arbitrary criterion, the "femaleness" factor was found to load, in decreasing order of importance, on affiliation, nurturance, —aggression, —autonomy, —achievement, succorance, and endurance. Significant mean differences were found for all of these scales except endurance. The "maleness" factor consisted of aggression, —deference, autonomy, and order. Two of these, deference and order, were found insignificant by the comparison of means technique. In addition, three scales indicated as important by the comparison of means—dominance, abasement, and change—did not emerge in the factor structure analysis.

The two analyses, then, produced quite different results. For several reasons, the more useful analysis seems to be the comparison of factor structures approach. First, factor analysis considers all personality scores for all subjects simultaneously. The distortions that sometimes accompany summary methods are thus eliminated. Secondly, the interrelationships among the personality traits are clearly indicated. Finally, the fundamental nature of the difference between the two groups is delineated by the technique of factor comparison. Such an analysis, then, would be a useful supplement to, if not replacement of, the comparison of mean differences approach.

E. SUMMARY

This study examined two approaches to the analysis of personality differences: a comparison of mean differences and a comparison of factor structures. The two approaches produced quite different results when applied to personality inventories for males and females. The comparison of means approach indicated rather vast differences, while the factor structure approach found considerable similarity between the factor structures of the groups. The factor

structure approach seemed the more useful because all personality scores for all subjects were considered simultaneously, because the interrelationships among the personality traits were indicated, and because the comparison of factor structures indicated the fundamental nature of the difference between the two groups.

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A SURVEY OF FEAR OF PREGNANCY AND DEPRESSION*[1]

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A. INTRODUCTION

Research on depression and oral contraceptives has been very frequent lately (2). Kutner, Phillips, and Hoag (8) have summarized the inconsistent findings in this area and have specified the need to study differences between women using the drug. For example, the studies have not taken into account the possibility that some "pill-users" may become less afraid of pregnancy and, as a result, less depressed. Nevertheless, Glick maintains "most clinicans believe that the improved sense of well-being, libido, etc. is due to the removal of the fear of becoming pregnant" (4, p. 369). Indeed, Moos (11) found that "pill-users" reported less premenstrual and menstrual negative affect than nonusers. Additionally, the drug seemed to induce an increase in menstrual symptoms in some women and a decrease in others, which raises the possibility of predispositions relative to side effects.

The present investigation, therefore, is concerned with the prevalence of the fear of pregnancy, and the relationship between this fear and depression. These steps are preparatory to research on fear of pregnancy and depression with oral contraceptives, which is being conducted by the Kaiser Contraceptive Drug Study. This longitudinal project is a long-term, comprehensive effort to uncover the side effects of birth control pills and corresponding predispositions or risk factors. The Kaiser Contraceptive Drug Study has been described by Kutner *et al* (8).

B. METHOD AND PROCEDURES

1. *Fear Survey Schedule*

The first method of measuring fear of pregnancy was the Fear Survey Schedule or FSS III (16), which is a widely used inventory of common fears. The inventory was modified by the addition of the item "becoming

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pregnant" to make a total of 78 fears. Each one was rated on a five-point scale (not at all, a little, a fair amount, much, very much). The total score of the FSS seems to approximate anxiety. Grossberg and Wilson (5) found a moderate correlation of +46 between the total FSS score and the Taylor Manifest Anxiety Scale (13). Thus, it was possible to relate fear of pregnancy to anxiety.

2. *Fear of Pregnancy Test*

A second index of fear of pregnancy was the Fear of Pregnancy Test (FOPT), which was developed especially for the Kaiser Contraceptive Drug Study. The need for the FOPT stemmed from the expectation that with the first measure, many women would respond "not at all afraid," even though they were somewhat or mildly afraid, whereas the FOPT measures fear of pregnancy through a rank order of a standardized list of 10 fears, including "becoming pregnant." The 10 fears were selected on the basis of the mean ratings they received from a portion of the sample that took the FSS III. Thus, the FOPT was derived from the FSS III on the basis of the potencies of the specific fears. A standardized potency hierarchy was constructed so that "becoming pregnant" would tend to occupy an intermediate position—that is, four fears stronger, four weaker, and one equivalent. The Test had a built-in norm of 5 to 6, since the score was the rank given to "becoming pregnant" in the respondent's own potency hierarchy (1 = most feared to 10 = least feared). The FOPT appeared as follows.

> The following is a list of things and experiences which may cause fear. Below the list are 10 blank spaces. Next to the number "1" write in the thing or experience in the List of Fears that you fear the most. Next to the number "2" write in the thing or experience in the List of Fears that you fear next to the most, and so on until you have written the thing or experience that you fear the least next to the number "10."
>
> *List of Fears:* Doctors, Failure, Becoming pregnant, Cats, Fire, One person bullying another, Harmless snakes, Being in a strange place, Weapons, Ugly people.
>
> *Order of Fears:* 1) —— (most feared); 2) ——; 3) —— 4) ——; 5) ——; 6) ——; 7) ——; 8) ——; 9) ——; 10) —— (least feared).

An equivalent form was constructed which placed "becoming pregnant" in the same position in the standardized potency hierarchy with a new set of nine other fears. However, the key item was now presented to the subject sixth instead of third in the list. Both forms were given to 51 women during their multiphasic examinations at a Kaiser Foundation Hospital in Northern California. The alternative form reliability coefficient was .89, which suggests that the order of presentation is irrelevant. Moreover, 93 women took the FOPT during the multiphasic examination and again between two and five weeks later. The test-retest reliability coefficient was .83. Kutner and Duffy (7) have reported some evidence that the FOPT is related to certain common side reactions to oral contraceptives.

3. *The Elation-Depression Scale*

The measure of depression was a modification of the elation-depression scale which was developed by Wessman and Ricks (15). Three scores were derived for best mood, worst mood, and general mood from the test which appeared as follows.

> The following is a list of statements describing various moods that people experience. Read the entire list and think of how you felt *yesterday.*
>
> 10. Complete elation. Rapturous joy and soaring ecstasy.
> 9. Very elated and in very high spirits. Tremendous delight and bouyancy.
> 8. Elated and in high spirits.
> 7. Feeling very good and cheerful.
> 6. Feeling pretty good, "O.K."
> 5. Feeling a little bit low. Just so-so.
> 4. Spirits low and somewhat "blue."
> 3. Depressed and feeling very low. Definitely "blue."
> 2. Tremendously depressed. Feeling terrible, miserable "Just awful."
> 1. Utter depression and gloom. Completely down. All is black and leaden.
>
> Now, write in the space provided below, the number next to the statement that best describes your:
>
> *a.* Highest or best mood for yesterday. ——
> *b.* Lowest or worst mood for yesterday. ——
> *c.* Average or general mood for yesterday. ——

4. *Sample and Procedures*

The subjects were taking a routine multiphasic examination at the Kaiser Foundation Hospital, Santa Clara, California. The examination has been described by Kutner *et al* (8). The women were told that this was part of a study of personality and oral contraceptives, and that their anonymity would be maintained. The FSS III, the elation-depression scale, and some questions on religion and sexual behavior were given to 106 women. They were white and generally middle class. The mean age was 36.1 and ranged from 21 to 53. All but seven women reported that they had at some time had sexual intercourse. Between two and six weeks later, during the second part of the multiphasic examination, 37 of these women were also given the FOPT and a checklist of reasons for fearing pregnancy.

C. RESULTS

1. *The Extensity and Intensity of Fear of Pregnancy*

Of the 106 respondents, some fear of pregnancy was reported by 42 or 39.6% ± 9.3 (95% confidence interval). Moreover, this fear reached phobic ("very much") intensity among 12 patients or 11.3% ± 6.0 (95% confidence interval). Table 1 gives the distribution of responses to the item "becoming pregnant." Only five (or roughly 6%) of the 78 items elicited a greater percentage of phobic reactions, which can be seen from Table 2. However, the mean score for "becoming pregnant" was .96 (or roughly equivalent to "a little afraid"), *SD* = 1.41, which was very close to the grand mean for all 78 items (grand mean = .84, *SD* = .97). This mean fear of pregnancy score places this fear in an intermediate position with respect to the other fears on the FSS III. Furthermore, this intermediate rating was corroborated by the mean FOPT score (5.83 out of 10) which was later derived from 1325 female multiphasic patients.

TABLE 1
RESPONSES TO BECOMING PREGNANT ON THE FSS III

Subjects	Not at all afraid	A little afraid	Moderately afraid	Much afraid	Very much afraid	Total
Number	64	12	12	6	12	106
Percentage	60.4	11.3	11.3	5.7	11.3	100

TABLE 2
FSS III ITEMS WITH PHOBIC RATINGS AT OR ABOVE 10%

Item	Percentage of group	Total number
Speaking in public	19.2	104
Witnessing surgical operation	19.2	104
Harmless snakes	15.1	106
Looking down from high buildings	14.1	107
Fire	13.1	107
Becoming pregnant	11.3	106
Prospect of surgical operation	11.3	106
Bats	11.2	107
High places on land	10.3	107

Note: Phobic rating = "very much afraid."

Fear of pregnancy was studied in terms of certain demographic characteristics. The FSS III measure of this fear was unrelated to age ($r = +.044$), even though age ranged from 21 to 53. This finding was later reinforced when the FOPT was given to 170 patients using contraception, whose mean age was 37 and ranged from 20 to 55 ($r = -.04$). Religious affiliation in the present sample was broken down into Catholics and Protestants. Table 3 demonstrates the significant tendency for Catholics to indicate a greater fear of pregnancy than Protestants. Frequency of church attendence for the Catholics and Protestants was dichotomized into "at least once a week" ($N = 38$) and "less than once a week" ($N = 39$). A chi-square analysis showed this variable to be independent of responses to "becoming pregnant" on the FSS III ($\chi^2 = 1.05$, $p > .05$, $df = 1$).

Table 4 presents the reasons for being afraid of pregnancy. Only 27 *S*s

TABLE 3
FEAR OF PREGNANCY (FSS III) AND RELIGION

	Level of fear					
	None		At least a little afraid		Total	
Religion	*N*	%	*N*	%	*N*	%
Catholic	11	38	18	62	29	100
Protestant	36	75	12	25	48	100
Total	47	61	30	39	77	100

Note: $\chi^2 = 8.94$ ($p < .01$, $df = 1$, two-tailed test with Yates' correction).

TABLE 4
REASONS FOR FEAR OF PREGNANCY

Reasons	No. of responses[a]	Percentage
Total	42	102
Checklist		
Responsibility for child care	6	14
Financial burden of pregnancy	4	10
Pregnancy dangerous to health	4	10
Emotional reaction during pregnancy—e.g., depression	4	10
Pregnancy is uncomfortable	2	5
Husband's unfavorable reaction	2	5
Danger of delivery	0	0
Write-in		
Too old	10	24
Have desired family size	4	10
Birth defects	2	5
Don't like babies	2	5
Don't like looks when pregnant	1	2
Child spacing	1	2

[a] *S*s were allowed multiple reasons; 27 *S*s responded.

responded, and 10 of them volunteered that they were "too old." Thus, little information was gained.

2. *Depression and Fear of Pregnancy*

Table 5 shows the depression results for the sample as a whole, as well as in terms of fear of pregnancy. The sample appears rather normal on the elation-depression scale. The "worst mood" tends to be "feeling a little bit low. Just so-so." The "average mood" tends to be "feeling pretty good, O.K." The "best mood" tends to be "feeling very good and cheerful." These group ratings are very similar to those found by Wessman and Ricks (15) among samples of male and female college students.

The mean ratings on best, average, and worst moods are slightly lower for women reporting some fear of pregnancy, as against those reporting none. In addition, Table 6 indicates that there is a mild (—.273) but significant correlation between "best mood" and the FSS III measure of fear of pregnancy. However, of the 88 *S*s who entered into this correlation, 55 (62.5%) reported that they were "not at all afraid" of pregnancy. This may have restricted the correlation coefficient. Therefore, the 25 Catholic *S*s, of whom only 11 (44%) answered in this manner, were analyzed separately. Their

TABLE 5
MEANS AND STANDARD DEVIATIONS FOR ELATION-DEPRESSION MEASURES IN TERMS OF FEAR OF PREGNANCY (FSS III)

	Level of fear								
	None			At least a little afraid			Total		
Mood	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*
Best	7.3	.83	54	6.8	1.35	34	7.1	1.09	88
Average	6.2	.97	56	5.8	.99	36	6.0	.99	92
Worst	5.1	1.17	51	4.6	1.52	34	4.9	1.33	85
Total	6.2	1.33	161	5.7	1.55	104	6.0	1.44	265

TABLE 6
PRODUCT-MOMENT CORRELATIONS BETWEEN FEAR OF PREGNANCY AND ELATION-DEPRESSION

Fear of pregnancy measures	Mood					
	Best		Average		Worst	
	r	*N*	*r*	*N*	*r*	*N*
FSS III	—.273[a]	88	—.170	91	—.131	85
FOPT[b]	+.233	34	+.017	37	+.056	34

[a] $p < .005$, one-tailed test.
[b] The greater the fear, the lower the score.

correlation between "best mood" and the FSS III measure of fear of pregnancy was —.363 ($p < .05$, $df = 23$, one-tailed test). Table 6 shows a correlation of +.233 between the same measure of depression and the FOPT. These findings suggest the greater the fear of pregnancy, the lower is the best mood on a given day. But Table 6 also indicates that the average and worst mood indices were not so closely associated with fear of pregnancy. Support for the relationship between depression and fear of pregnancy was given by the correlation between the total fear score on the FSS III and the score on the item "becoming pregnant" of +.416 ($p < .001$, one-tailed, $df = 97$). Hence, fear of pregnancy is directly related to both depression and anxiety.

It was possible to do some probing of the nature of the relationship between fear of pregnancy and depression. Since religious affiliation was related to fear of pregnancy, it was asked whether religion is related to depression. The Catholics ($N = 25$), on the average, rated their best mood at 7.1, and the Protestants ($N = 40$) did exactly the same (7.1). Further, it was asked if depression were related to fear of pregnancy because of the intensity with which this fear was felt, regardless of anything else. In contradiction, however, one of the most "phobic" fears, "speaking in public," was independent of "best mood" ($r = —.127$, $p > .05$, $df = 83$).

D. Discussion

The survey of fear of pregnancy showed that this fear was widespread and considerably intense among women taking a multiphasic examination. However, these reports of fear cannot be accounted for by general anxiety or depression levels because the sample appeared normal on these traits. The mean FSS score of .84 ($SD = .97$) corresponds closely to comparable estimates made with college samples (6, 10). Likewise, the elation-depression scale yielded normal means. Nor can the prevalence of fear of pregnancy in this sample merely be imputed to Catholics, since less than one-third were Catholics. Thus, Catholics were not overrepresented in this sample. Moreover, 25% of the Protestants admitted to being afraid of pregnancy. The finding that Catholics are more afraid of pregnancy than Protestants is probably due to the Catholics' use of less effective contraception. For example, Phillips (12) found that Catholic couples are less likely to choose a tubal ligation or vasectomy than non-Catholic members of the Kaiser Foundation Health Plan in Northern California.

Similar correlations between two different measures of fear of pregnancy and the "best mood" ratings on the elation-depression scale were found.

Nevertheless the relationships were weak. However, mood is only one aspect of depression. Therefore, future research should compare fear of pregnancy to cognitive and physiological symptoms of depression. Additionally, these variables should be studied premenstrually, when their association should be strongest.

The +.416 correlation between the FSS III measure of fear of pregnancy and the total fear score agrees with +.41 correlation found by Tasto and Hickson (14) for the same variables. Likewise, Doty (3) demonstrated that women who are primiparae score more highly on the neurotic triad (scales 1, 2, and 3) of the Minnesota Multiphasic Personality Inventory (MMPI) to the extent that they fear pregnancy. Thus, the greater the fear of pregnancy, the greater the depression and anxiety, as reflected by the present and previous research. Further, it appears from the present correlation of —.127 between "best mood" and fear of speaking in public, that depression is related to fear of pregnancy not because of the intensity of this fear alone. Perhaps depression becomes associated with fear of pregnancy, or any other fear, when the stimuli related to this fear are frequently encountered—that is, when the risk is high. For example, speaking in public, although terrifing for some people, can be easily avoided and therefore not depressing, whereas sexual intercourse may be rather difficult to avoid for a married woman.

The applicability of this research to explaining reductions in depression among users of oral contraceptives depends on whether depression is the consequent of fear of pregnancy. Conversely, depressed women may become more afraid of child training and of other ramifications of pregnancy. The direction of the relationship is unknown. Hence, future research should concentrate on intraindividual changes in this fear and depression, ideally, before and after "the pill." Perhaps depression can be diminished when "the pill" reduces fear of pregnancy.

That some women do undergo a reduction in fear of pregnancy with oral contraceptives has been demonstrated by Kutner and Duffy (7). Specifically, their research showed that "pill-users" who report less fear of pregnancy after three months of pill use also report fewer of the common minor side effects, such as swollen and sore breasts, than "pill-users" who do not report a decrease in this fear. How these conditions are related to depression is unknown. Nevertheless, some studies (1, 9) have found that a reduction in a specific fear (namely, snakes) generalizes to reductions in anxiety. Thus, if "the pill" reduces fear of pregnancy, it may have general psychological effects. Irrespective of the direction of the relationship between fear of pregnancy and depression, the current findings suggest that cross-sectional stuc of depression which compare "pill-users" to users of other methods sho control for differences in fear of pregnancy.

E. SUMMARY

The study estimated fear of pregnancy and its relationship to depressic The *S*s were 106 women taking a multiphasic health examination. A modifi Fear Survey Schedule found that 42 *S*s or 39.6% ± 9.3 (95% confiden interval) reported a fear of pregnancy. The elation-depression scale yield means on best, average, and worst moods that were more depressed for reporting this fear. Catholic *S*s generated a —.363 ($p < .05$, $df = 23$) co relation between fear of pregnancy and "best mood." It was concluded th women who are afraid of pregnancy tend to be more depressed; therefor fear of pregnancy may predict changes in depression in reaction to oral con traceptives.

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MANIFESTED ANXIETY IN CHINESE AND AMERICAN CHILDREN*[1]

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A. INTRODUCTION

During the past few years, there has been a growing interest in cross-cultural studies of anxiety. Although the research results are inconclusive, a general finding may be noted. Namely, there are cultural differences in anxiety level. In attempting to interpret the different anxiety levels between two cultures, authors have offered varied hypothetical explanations that seem to be applicable to the cultures studied. Several hypothetical explanations are merited consideration here. These explanations will also serve as a frame of reference for proposing the main hypothesis for the present study.

Cattell and Scheier (3) compared six cultural groups of college students and found significant differences in anxiety level. Polish and Indian students were found to be most anxious, and English and American students least anxious. The authors interpreted the findings in terms of the difference in social, political, and economic conditions. Poland and India have a markedly lower standard of living than do Britain or the United States, where also, political freedom is more deeply entrenched in tradition and practices than is the case of the former.

In a recent cross-cultural comparative study using the Children's Manifest Anxiety Scale—CMAS (1), Iwawaki *et al.* (12) found a significantly lower level of anxiety in Japanese nine-year-old children when compared with the same age groups in France and the United States. These findings contradict directly those obtained for adult samples where Japanese showed a higher level of anxiety than Americans (2). The researchers accounted for these contradictory findings as resulting from the changes in child-rearing practices and family atmosphere in Japan, which after World War II shifted from an

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authoritarian state to a more permissive one. Ziv and Shauber (20) offered essentially the same explanation in one of the latest studies in this area. The authors found that the anxiety level in Israeli children was significantly lower than among Japanese, French, and American children. They proposed that the low anxiety level of Israeli children is due to a free social atmosphere, as well as the children's freedom of action and expression.

Gotts (5), however, is not entirely satisfied with the interpretation made by Iwawaki *et al.* to accommodate the conflicting findings between Japanese college students and school children as compared to American subjects. He hypothesizes that anxiety follows a course parallel to that of social restrictions or pressures which are imposed upon individuals in age-linked sequence. Individuals manifest higher anxiety during those age periods when societal restrictions upon them are greater. According to Benedict, the author cited, both the young and the aged in Japan enjoy greater freedom of expression, for example, in the areas of sexuality and aggression than do persons in the middle years of life. This is in striking contrast to American society, where the young and the aged are more constrained than those in the middle range of life.

These hypothetical explanations of cultural differences are useful in serving as a frame of reference in making an hypothesis for the comparison of anxiety levels in Chinese and American children.

First, it is a well-known fact that the standard of living in Taiwan is markedly lower than that in the United States. Also, historically and traditionally, Americans have been enjoying more political freedom than their Chinese brothers in Taiwan.

Second, evidence suggests that the Chinese family employs more severe child-rearing practices than American parents in four of five areas—namely, oral, sex, dependence, and aggression training. There is no difference in severity in anal training between the two cultures (18).

Third, in comparison with American children, Chinese children are probably exposed to a greater number of societal restrictions. Hsu (10) points out that the restrictions imposed upon Chineses children come not only from parents and other seniors, but also from custom and tradition. Furthermore, discipline with Chinese children tends to be inconsistent because it is never exclusively in the hands of parents. For not only those seniors who live in the same home, such as aunts, uncles, and grandparents, but in-laws, neighbors, and friends can actively interfere with it (11). In contrast, there is so much attention paid to infancy and so many privileges accorded childhood in the United States that it has been labeled as "a paradise on earth for children" (10, p. 71). Hsu summarizes the differences between parental attitudes of the two cultures as this: "The important thing to Americans is what parents should do for their children; to Chinese, what children should do for their parents" (10, p. 72).

Fourth, there is another difference in parental attitudes toward child rearing. American parents try diligently to maintain a front of sweetness and light before their children even in serious domestic trouble or during a major business catastrophe. Chinese parents, on the contrary, make little effort to hide their problems and worries. Chinese youngsters suffer in disaster as well as celebrate in triumph with adults, while American children live in a happy environment which is separated from parental worries (10). Thus, Chinese parents may unwittingly transmit their worries or anxieties to their children.

Finally, there is a tremendous pressure of examinations on Chinese children which is not experienced by American youngsters. The annual school-entrance examinations tax emotions of both pupils and parents to the utmost and sometimes result in tragedy. Cases of suicide or running away from home because of the failure of school-entrance examinations have been reported (7). It is not uncommon for private tutors to be hired for coaching children as early as the first or second year of school life to be better prepared for examinations in the future. As Iwawaki *et al.* (12) points out, the school-entrance examinations may have anxiety augmenting effects on children.

It is not known how these five factors interact with one another, but the comparisons clearly and unambiguously put Chinese children, as compared to American children, in a more disadvantageous position as far as anxiety level is concerned. It is hypothesized that Chinese children tend to be more anxious than American children. The main purpose of the present study was to test this hypothesis. Specifically, the study was designed to make (*a*) separate within-cultural comparisons for both Chinese and American children on the Anxiety and Lie scales of the CMAS with respect to sex, grade, and school; (*b*) separate cross-cultural comparisons between Chinese and American children on the Anxiety and Lie scales with respect to sex and culture.

B. METHOD

1. *Subjects*

a. Chinese subjects. Two samples of 613 children, 312 boys and 301 girls, were selected from the northern part of Taiwan, China. The first sample included 298 fourth and fifth graders from Chungli; the second sample included 315 children at the same grade levels from Pusing. Chungli is an agricultural-commercial center of 50,000 people with some textile and chemical industries, while Pusing is a small rural town of 4000 people. Each sample was drawn from a public elementary school with middle- and working-class children. Approximately 30 percent of the fourth and fifth grade population was sampled from each school. This included 12 classes, six from each school; within each school, there were three classes from the fourth grade and three from the fifth grade. The median and quartile deviation of age for the fourth grade subjects were 9 years 8 months, and 3 months, respectively. The corresponding values for the fifth grade children were 10 years 8 months, and 3 months.

b. American subjects. Kokomo and its vicinity and Camden in Indiana were chosen for the area of sampling American subjects, for their social-economical climate is comparable to that of Chungli and Pusing. Kokomo is an industrial-commercial center of 50,000 people, with concentrations of auto parts, radio, electronic equipments, and special alloy industries, while Camden is a small rural town of 1000 people. Since American elementary schools are markedly smaller than Chinese elementary schools, more samples and more schools were involved. The samples consisted of 381 fourth and fifth grade children, 182 boys and 199 girls, chosen from six public elementary schools with children from middle- and working-class families. The percentage of the population being sampled varied from school to school. All fourth and fifth graders in two schools were used; about half of the fourth grade population in three other schools was sampled; and all fifth graders in another school participated in the study. The median and quartile deviation for the fourth grade subjects were 9 years 9 months, and 3 months, respectively. The corresponding values for the fifth grade subjects were 10 years 8 months, and 4 months.

2. *Instruments*

Because of its simplicity and objectivity, the children's form of the manifest anxiety scale (CMAS) developed by Castaneda, McCandless, and Palermo (1) was adopted as a measuring instrument for the study. The CMAS yields two scores, one for Lie and one for Anxiety.

For the American subjects, the original English-language version of the CMAS was used. For the Chinese subjects, a Chinese translation was employed. The translation was made by the present author. Accompanied by its original, the translated version was then given to four other Chinese, including two former public school teachers, a psychologist, and a librarian, for their suggestions in language usage. Words and phrases were chosen so as to insure that the items would be entirely comprehensible to 9- or 10-year-old Chinese children. The final items were printed in exactly the same order as in the original English-language version.

3. *Procedure*

Both the Chinese and American children were tested on a group basis in individual classrooms by the classroom teachers. Standard CMAS instructions described by the original authors were followed by each teacher who administered the test. These instructions were translated into Chinese and printed on the test booklet of the Chinese version as they were printed on that of the original version. Each subject, from both countries, was asked to fill in his name, date of birth, sex, and grade before he began to answer the questions. The testing programs were completed within three months, beginning in the middle of October, 1970.

C. RESULTS

Scores for the Lie and Anxiety scales were obtained for each subject. Group means and variances were computed for different grade levels, as well as for different cultures, and for boys and girls separately. Tables 1 and 2 present these descriptive statistics with respect to culture, grade, sex, and number of the subjects.

TABLE 1
MEANS AND STANDARD DEVIATIONS FOR ANXIETY SCALE FOR CHINESE AND AMERICAN SAMPLES

		Fourth grade			Fifth grade	
Sex	*N*	Mean	*SD*	*N*	Mean	*SD*
Chinese						
Boys	153	21.54	6.12	159	20.44	6.65
Girls	146	23.78	6.13	155	20.97	7.54
Total	299	22.63	6.22	314	20.70	7.11
American						
Boys	91	17.27	7.50	91	17.90	7.51
Girls	103	19.99	8.19	96	19.46	8.25
Total	194	18.72	7.99	187	18.70	7.94

TABLE 2
MEANS AND STANDARD DEVIATIONS FOR LIE SCALE FOR CHINESE AND AMERICAN SAMPLES

		Fourth grade			Fifth grade	
Sex	*N*	Mean	*SD*	*N*	Mean	*SD*
Chinese						
Boys	153	4.26	2.34	159	4.32	2.44
Girls	146	4.59	2.57	155	4.74	2.73
Total	299	4.42	2.42	314	4.53	2.60
American						
Boys	91	3.65	2.23	91	2.44	2.04
Girls	103	3.85	2.41	96	2.98	2.32
Total	194	3.76	2.33	187	2.72	2.20

1. *Comparison of Chinese Samples*

a. Reliabilities of Chinese translation of Anxiety and Lie scales. Reliability coefficients of both the Anxiety scale and Lie scale were estimated on the basis of Pearson product-moment correlations between the odd and even items for different grade levels and for boys and girls separately. All correlations of the odd and even items for both scales were significant at well beyond the .01 level, demonstrating that the translated scales were internally consistent. The reliability coefficients of the Anxiety scale after correction according to the Spearman-Brown formula were .80, .77, .82, and .86, for the fourth grade boys, fourth grade girls, fifth grade boys, and fifth grade girls, respectively. The reliability coefficients of the Lie scale after correction according to the Horst[3] formula (6) were .57, .72, .69, and .83, for the fourth grade boys, fourth grade girls, fifth grade boys, and fifth grade girls, respectively. In comparison with the Anxiety scale, the reliability coefficients of the Lie scale were somewhat lower. This difference undoubtedly reflected the difference in the number of items that comprise the two scales, as pointed out by the original authors of the CMAS.

b. Relations between Anxiety and Lie scales. Pearson product-moment correlations were computed for the two grade levels and for boys and girls separately. The respective correlations were —.24, —.35, —.33, and —.37 for the fourth grade boys, fourth grade girls, fifth grade boys, and fifth grade girls. All correlations were significantly different from zero, indicating a tendency for the two scales to be inversely related. These results were consistent with some studies (14, 15, 17), but inconsistent with other studies (1, 9, 12, 13). The results suggest that the Anxiety scale scores in the Chinese samples may have been contaminated somewhat by social-desirability responding.

c. Comparison of group means. Separate 2 × 2 × 2 analyses of variance (sex × grade × school) were performed for the Anxiety and Lie scales. For the purpose of simplifying the computational procedure, the original unequal cell frequencies ($N = 78, 71, 75, 75, 83, 76,$ and 72) were made equal by a random selection of extra cases to be excluded from the analyses. As a result, 568 subjects were included in the analyses, 71 in each cell. For the Anxiety scale, all main effects of sex, grade, and school were significant at beyond the .01 level, but none of the interaction effects approached significance. Girls tended to score higher than boys, fourth graders higher than fifth graders, and Pusing school children higher than Chungli school children ($F = 7.00$, 14.23, 22.01, respectively; $df = 1/560$; $p < .01$ for every F value).

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[3] Since the Lie scale has an odd number of items, the Horst formula rather than the Spearman-Brown formula was used for correction of the reliability coefficients.

For the Lie scale, only the main effect of school was significant. The main effect of sex or grade, as well as interaction effects, failed to reach a significant level. As with the Anxiety scale, the Pusing subjects obtained significantly higher lie scores than did the Chungli subjects ($F = 18.32$, $df = 1/560$, $p < .01$).

2. *Comparison of American Samples*

Since the reliability of the original CMAS has been previously reported (1, 8, 13, 17), the present study did not attempt to include the reliability data for the American children.

a. Relations between Anxiety and Lie scales. As with the Chinese samples, Pearson product-moment correlations were computed for different grade levels and for boys and girls separately. The respective correlations were —.01, —.09, —.04, and .12 for the fourth grade boys, fourth grade girls, fifth grade boys, and fifth grade girls, none departing significantly from zero. These findings were strikingly in contrast to those found in the Chinese samples, in which case every correlation was highly significant.

b. Comparison of group means. As described previously, there were only two elementary schools, one in the suburban area of Kokomo, the other at Camden, from which both fourth and fifth grade samples were drawn. For the remaining four schools, only one grade level was used. Accordingly, separate 2 × 2 ×2 analyses of variance (sex × grade × school) for the Anxiety and Lie scales were performed on the data from only these two schools.

As with the Chinese samples, unequal cell frequencies ($N = 25, 26, 26, 20, 27, 29, 27$, and 29) were made equal by selecting randomly the extra cases to be excluded from the analyses. As a result, 160 subjects were included in the analyses, 20 in each cell. For the Anxiety scale, significant main effects of sex and school were found. The main effect of grade, as well as the interaction effects, fell far short of significance. Girls tended to score higher than boys ($F = 5.15$, $df = 1/152$, $p < .05$), and Camden school children higher than Kokomo school children ($F = 6.26$, $df = 1/152$, $p < .05$). The overall findings were consistent with those for the Chinese children with the exception of the difference between the two grade levels.

For the Lie scale, only the main effect of grade was found to be significant. The main effects of sex and school, as well as the interaction effects, failed to approach significance. Fourth grade children tended to score higher than fifth grade children ($F = 14.23$, $df = 1/152$, $p < .01$). The findings were somewhat different from those for the Chinese samples, where the only significant difference was found between the two schools.

3. *Comparison of Chinese and American Samples*

Cross-cultural comparisons were made separately for the fourth and fifth grade samples, as well as for the Anxiety and Lie scales.

a. Comparison of Chinese and American fourth grade samples. Separate 2 × 2 analyses of variance (culture × sex) were performed for the fourth grade subjects for both the Anxiety and Lie scales. Because of unequal cell frequencies ($N = 153, 146, 91$, and 103), the unweighted-mean solution technique was employed (19). Significant main effects were found between cultures, as well as between sexes ($F = 40.16, 15.12$, respectively; $df = 1/489$; $p < .01$ for both F values). But the interaction effect failed to reach a significant level. The Chinese children obtained significantly higher Anxiety scores than American children, which was attributable to significantly higher scores for Chinese boys in comparison with American boys ($t = 4.69, p < .01$) and significantly scores for Chinese girls in comparison with American girls ($t = 4.27, p < .01$). Girls were found to be more anxious than boys, which resulted from significantly higher scores for Chinese girls than for Chinese boys ($t = 2.81, p < .01$), as well as significantly higher scores for American girls than for American boys ($t = 2.73, p < .01$).

For the Lie scale, the main effect of culture was significant, but neither the sex main effect nor the interaction effect approached significance. Chinese fourth graders in comparison with American fourth graders scored higher on the Lie scale ($F = 9.18, df = 1/489, p < .01$). The results were attributable to a slightly higher mean score for Chinese boys than for American boys ($t = 1.91, p < .1$) and a significantly higher mean score for Chinese girls than for American girls ($t = 2.38, p < .05$).

b. Comparison of Chinese and American fifth grade samples. As with the analyses for fourth grade subjects, separate 2 × 2 analyses of variance (culture × sex) were performed on the data of the fifth graders for the Anxiety and Lie scales. Again, the unweighted-mean solution method was used because of unequal cell frequencies ($N = 159, 155, 91$, and 96). The significant main effect of culture was noted ($F = 8.68, df = 1/497, p < .01$). Neither the main effect of sex nor the interaction effect approached significance. As with fourth grade children, Chinese fifth grade children scored significantly higher on the Anxiety scale than American fifth grade children. Individual comparisons indicated, however, that only the difference between Chinese boys and American boys was significant ($t = 2.59, p < .05$). The difference between Chinese girls and American girls was not significant, though it was in the expected direction ($t = 1.57$, approaching $p = .1$).

For the Lie scale, both the main effects of culture and sex were significant. The interaction effect failed to reach significance. As with fourth grade samples, again, Chinese fifth graders scored significantly higher than American fifth graders ($F = 64.55$, $df = 1/497$, $p < .01$). The results were attributable to significantly higher scores for Chinese boys in comparison with American boys, as well as significantly higher scores for Chinese girls in comparison with American girls ($t = 5.82$, $p < .01$; $t = 5.50$, $p < .01$, respectively). Girls were found to have significantly higher Lie scores than boys ($F = 4.62$, $df = 1/497$, $p < .05$), which was as a result of significantly higher scores for Chinese girls in comparison with American boys ($t = 7.08$, $p < .01$).

D. DISCUSSION

From comparisons between the two cultures in relation to five factors—i.e., social-economic-political condition, child rearing, societal restriction, parental attitude toward children's knowledge of domestic troubles or worries, and examination pressure—it was hypothesized that Chinese children tend to be more anxious than American children. The overall findings of the present study confirmed this hypothesis. Separate cross-cultural comparisons were made with respect to sex as well as grade. Among both fourth and fifth grade samples, Chinese boys were found to be significantly more anxious than American boys, and Chinese girls to be more anxious than American girls.

Additional analyses showed that these findings may have been contaminated somwhat by a tendency for the Chinese children to respond to the Anxiety items in a socially desirable direction as reflected by significant negative correlations between Anxiety and Lie scores. There was no significant relationship between the Anxiety and Lie scales among American samples, an indication that the same tendency was not present. That the social-desirability response tendency is present in Chinese children suggests that the Anxiety scale differences, if anything, underestimate true differences between the two cultural groups. The Anxiety scores of the Chinese children would have been even higher than those obtained, if some of them had not falsified their responses in a socially desirable direction. The results, taken at face value, provide support for all hypothetical explanations offered by previous authors (3, 5, 12, 20). It is not known, however, how much each of the five factors contributed to the anxiety levels of the two cultures.

A rival hypothesis for interpreting the findings may be formulated, based upon the fact that the Chinese children also scored significantly higher on the

Lie scale. Since the keyed answer for all Anxiety items, and nine of 11 Lie items, is "yes," could it be that the Chinese children's higher Anxiety and Lie scores were both due to the children's response tendency to answer "yes," disregarding the nature of the item? The answer is no! As mentioned previously, there were significant negative correlations between the Anxiety and Lie scale scores in the Chinese samples. Children who scored relatively high on the Anxiety scale tended to score relatively low on the Lie scale and *vice versa*. Apparently they responded according to the nature or content of the item, rather than blindly according to a personal response set.

Overall cross-cultural comparisons indicated that there were significant sex differences in Anxiety scores for both Chinese and American fourth grade subjects, but not for fifth grade subjects. Analyses within individual cultural groups showed that the Chinese girls scored significantly higher on the Anxiety scale than the Chinese boys. Also, on the basis of the data from the two American elementary schools where both grades were sampled, girls were more anxious than boys. These findings were consistent with those of some previously reported studies (1, 17), but inconsistent with the findings of others (8, 16).

It is interesting to note, for the Chinese samples, that the Pusing school children had a significantly higher anxiety level than did the Chungli school children. For the American samples, the Camden school children were significantly more anxious than were the children in the Kokomo suburban area. This ecological difference within cultures may be explained by Cattell and Scheier's socioeconomic hypothesis. According to this hypothesis, a high anxiety level is associated with a low standard of living and *vice versa*. Chungli has a higher standard of living than Pusing, while the Kokomo suburban area seems to have a higher standard of living than Camden.

As for the Lie scale, the sex differences were not significant within individual cultural groups. However, significantly different Lie scores were found between the two schools in the Chinese samples and between the two grades in the American samples.

Although the translated CMAS was found to be internally consistent and the reliability coefficients were comparable to those of the original version (1, 8, 13, 17), caution must be taken in interpreting the findings. Two points should especially be emphasized here: (*a*) despite the relatively large number of cases used in the study, neither Chinese nor American samples were highly representative; (*b*) even though great care was taken during translation to insure the maximum equivalence of language meanings, there probably existed the problem of a language difference between the translated and original versions of the CMAS.

Ziv and Shauber (20) point out that the value of a cross-cultural comparison, using nonrepresentative samples, is undoubtedly very limited. Perhaps the value of these studies, including the present study, lies in their contributions to building hypotheses which demand further investigations using more representative samples. The author is disturbed by the fact that two very recent cross-cultural studies in children's anxiety used the same samples for comparisons. American and French samples from previous studies were used by Iwawaki *et al.* (12) for making comparisons with Japanese children, and by Ziv and Shauber (20) for making comparisons with Israeli children. While this approach is rather practical and convenient, the danger should at the same time be recognized. The practice actually repeats the same deficiencies caused by inadequate sampling or other limitations. Levitt's (15) findings and the findings of the present study clearly indicate that there are ecological differences in children's anxiety level. Cross-cultural studies in the future, if a true picture is to be acquired, must consider the geographical location of samples within each individual culture so that more representative samples can be obtained.

There is probably no effective solution to the problem of a language difference in cross-cultural studies using a verbal instrument. There are two possible approaches that can and have been used: either (*a*) keeping the original version and using bilingual subjects, or (*b*) making a translation. Earle (4) points out that both methods present some obvious difficulties, and we should not assume equivalence of measurement by either method.

E. SUMMARY

The present study was designed to compare the anxiety levels of Chinese and American children, as well as to make comparisons of the anxiety levels of such children within the respective cultures. The Children's Manifest Anxiety Scale (CMAS) was given to 381 American fourth and fifth grade children; a translation of the same test was administered to 613 Chinese children at the same grade levels. The results show, for both the fourth and fifth grade levels, that the Chinese children obtained significantly higher scores than did the American children on both the Anxiety and Lie scales. Apparently these differences were not due to the possibility that Chinese children might have a response set to answer "yes" to questions of any nature. Within each cultural group, girls were found to be more anxious than boys, and children from one geographical area to be more anxious than children from the other area. These ecological differences led to the suggestion that the geographical location of samples must be given serious consideration in future cross-cultural studies if the sampling is to be adequate.

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COGNITIVE CAPACITY OF VERY YOUNG CHILDREN: YET ANOTHER REPLICATION*

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A. INTRODUCTION

This study is a replication of Mehler and Bever's "Cognitive capacity of very young children" (6). As their study has caused considerable controversy, and since refutations of their findings have been based on studies (1, 2, 8) similar to but not exact replications of their design, the present study was conducted in an attempt to reproduce the original procedures more closely. Three minor differences were introduced:

1. The children could respond nonverbally to either task, instead of only to the task involving the M&M candies.

2. The distances between the candies and buttons were modified to take into consideration Piaget's (8) criticism that the extreme differences in row length between the two experimental conditions caused conflict in the children. (In Mehler and Bever's study, the ratio of the lengths of the rows in one experimental condition was 8 to 5, while the ratio of the lengths of the rows in the other was 25 to 5.) Piaget claimed that "subjects at an intermediate stage between evaluation by 'crowding' and evaluation by length are obviously more apt to be struck by length," and since in one of the experimental conditions the low row contains six elements (as opposed to four in the short row) "evaluation by length happens in fact to give the correct answer" (8, p. 977). In this study the longer row was 10 inches long regardless of the number of objects it contained, thereby making the ratio of the lengths between the rows much less extreme.

3. To control for another of Piaget's criticisms—that some *S*s always say the manipulated row has "more"—both rows were manipulated in the transformation from one experimental condition to the other.

B. METHOD

1. *Subjects*

The *S*s were 66 children between the ages of 2:3 and 5:11 years from

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three nursery schools in the Madison, Wisconsin, area.[1] There were 32 girls and 34 boys.

2. *Procedure*

Two experimental sequences using pairs of rows of objects were presented to each child. In one of the sequences, rows of M&M candies were used; in the other, rows of wooden buttons were used. The child was asked if two rows, each containing four objects and of equal lengths, were the "same" or "different" and was asked to explain why. Then the pair of rows was altered in sight of the child: two objects were added to one row, and the lengths of both rows were altered to make them unequal. *S* was asked if the rows were the "same" or "different," and if different, which row had "more." The row configuration was again changed, the longer row becoming the short row, and the same questions were again asked. In the sequence with M&M candies, the child was told he could have the row of candies with "more" in it. If the child appeared unwilling to talk, he was encouraged to point to which row had "more." The experimenter asked the questions several times or reworded them if the child was unresponsive.

The order of presentation of the M&M candies and buttons was randomized across *S*s. Configuration changes and row additions (nearer or farther away from the child) were also randomized. In all cases the rows were presented horizontally before the child.

C. RESULTS

Mehler and Bever divided their sample into 11 groups based upon three-month age intervals. Because of our more limited sample size, the age levels in the present study were compressed into three groups. The formation of these groups was based upon Mehler and Bever's comment that "under 3:2 children exhibit a form of quantity conservation; they lose it as they get older and do not exhibit it again until they are about 4:6" (6, p. 30). A chi-square test on our data was not feasible, because of the small sample size of the youngest group, 2:3 to 3:1. Nevertheless, it is clear that our data do not support Mehler and Bever's findings, but in fact show a clear trend of increasing success at completing the tasks with increasing age of the subjects (see Table 1).

In light of Mehler and Bever's conclusion that children under 4:0 years

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[1] Appreciation is extended to the Meeting House Nursery School, the Unitarian Nursery School, and Mary Moppet's of Madison, Inc., for their help and cooperation.

TABLE 1
SUMMARY OF CHILDREN'S CONSERVATION PERFORMANCE

Age level	Percentage of successful completions[a]					
	Button task		M&M task		Both tasks	
2:3 to 3:1	01	[1]	23	[3]	00	[0]
3:2 to 4:5	29	[8]	44	[12]	26	[7]
4:6 to 5:11	54	[14]	65	[17]	46	[12]

[a] Number of *S*s in brackets.

could successfully complete the given experimental sequences, we examined the data from this study in terms of two age groups—those under 4:0 years and those above 4:0 years. In this sample, 27 *S*s were between the ages of 2:3 and 4:0, and 39 *S*s were between the ages of 4:1 and 5:11 years. On the button task, significantly more children in the older age group successfully completed the task than in the younger age group ($\chi^2 = 6.95$, $df = 1$, $p < .01$). Likewise on the M&M candy task, a significantly greater number of *S*s in the older age group successfully completed the task ($\chi^2 = 5.77$, $df = 1$, $p < .025$).

Neither age group successfully completed one task significantly more often than the other task. This leaves open to question the importance of the motivational component inherent in any specific task designed by experimenters. Mehler and Bever suggested that the use of candy may have been cause for what they interpreted as increased motivation in the M&M candy task. However, Rothenberg and Courtney (9) proposed an alternative explanation. They interpreted the higher number of responses on the M&M candy task in the Mehler and Bever study as a function of the questions or commands given. They suggested that the word "eat" is more easily understood by children than the word "more," as used in the clay pellet task.

Of the 32 *S*s who successfully completed one or the other of the tasks, 19 (59 percent) successfully completed both. Table 1 shows these percentages. The trend stated earlier is again clearly evident: the successful completion of either or both tasks increases with the age of the *S*s.

D. DISCUSSION

This study failed to replicate the findings of Mehler and Bever (6) and of Bever, Mehler, and Epstein (3) that very young children (2:0 to 2:5 years) have the capacity to conserve quantity. The Bever *et al.* (3) study dealt with both of Piaget's criticisms concerning row-length ratios and row manipulation. The present study also modified the original design somewhat in answer to these criticisms, but yet failed to find that younger children perform "extremely well" and that older children perform "markedly less well," as reported by Bever *et al.* (7, p. 980). Similar to the findings presented here, Estes and Combs (4) also found age to be positively correlated with successful completion of a perception of "more" task using marbles for the ages 3:2 to 5:2 years.

These contradictory findings and those obtained by others (2, 8) are important, not because they have attempted to explore the concept of quantity conservation in very young children, but simply because they have begun exploration into the cognitive capacities of children not yet verbally fluent. Moreover, this series of studies should be of importance to psychologists in any area of developmental research, for it has helped obviate that persistent nemesis—the nature-nurture issue. It seems fruitful to go beyond the obscurant results of group percentages and examine what is happening within each of the individuals tested. Mehler and Bever (6) have postulated an innate mechanism, but one that is so fragile that it is overpowered by the child's perceptions at certain ages. This seems to fit into Piaget's equilibration model of child- environment interaction. What is innate seems not to be a genetically programmed mechanism, but rather a mode of functioning. This mode of functioning changes as the child develops and experiences—as he actively creates new knowledge for himself. The question to be asked then is, what are the experiences and operations in which the child engages that expand this primitive mode of functioning into richer, more stable, and more complete structures?

If this question becomes the primary one, answers to such debates as those concerning the assessment of a child's understanding of certain abstract, relational terms—i.e., "more" and "less" (*cf.* 5)—or those concerning the interpretation of the child's nonverbal responses will become only incidental issues. New methodologies must be developed to elucidate the series of operations and equilibrations, in which even errors play a success-promoting role, that take place when a child creates knowledge.

An important component of these new methodologies might be an intensive and extensive use of Piaget's clinical interview method creatively adapted to the young child's limited verbal and mostly action-oriented life-style. Such an intensive method is likely to bring to light cognitive modes of functioning in the very young child that are as orderly and interpretable as has been discovered, through this method, for children above 5 years of age.

E. SUMMARY

Mehler and Bever's study of conservation of quantity in very young children was replicated. Unlike Mehler and Bever's findings, and similar to the findings of other replications, it was found that with increasing age (2:3 to 5:11 years) an increasing number of children successfully responded to the conservation tasks. The implications of these findings were discussed in relation to the cognitive competence of young children with limited language ability.

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COMPARISON OF ALBINO RATS AND MONGOLIAN GERBILS ON THE VISUAL CLIFF*

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A. Introduction

O'Sullivan and Spear (4) compared performance of the white rat and the hooded rat on the visual cliff. In their study the hooded rats descended 93 percent of the time to the shallow side of the apparatus, while the white rats descended to the shallow side 33 percent of the time. They concluded that the white rats in going to the deep side 67 percent of the time showed they had the poorer depth perception of the two groups of *S*s.

Love, Kam, and Newby (3) studied visual and nonvisual depth perception in young and adult rats. It was found there was no significant difference in the age of the rat on its depth perception. Performances of the *S*s on the visual cliff were relatively constant regardless of age.

Cole and Topping (1) in working with gerbils on the visual cliff found that they demonstrated both depth and distance perception. The *S*s consistently avoided going over the visual drop-off and indicated a preference for the shallow side of the apparatus.

Collins, Lindzey, and Thiessen (2), studying mongolian gerbils, found that when cliffs differing only in visual cues were used, latencies to descend were significantly lower from the shallow side. They concluded that this would be an indication that gerbils could perceive the depth of the deep side and much more quickly cross to the shallow side.

Thiessen, Lindzey, and Collins (5) also worked with young gerbils and with their early experiences with visual cliffs. They found that descent from a deep cliff was more apt to occur in *S*s with previous cliff experiences and when a minimum of visual depth cues were present.

The present paper considered the performance of albino rats and mongolian gerbils on the visual cliff. It attempted to find out if there were differences in depth perception between the two groups of animals when age and sex were held constant.

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B. METHOD

1. *Subjects*

Subjects were six albino rats and six mongolian gerbils bred and reared in the psychological laboratories of St. Procopius College for three generations. The rats were originally from a Sprague-Dawley strain. The *S*s chosen for the research were randomly selected from laboratory animals within the specified age group—from 30 to 50 days old.

2. *Apparatus*

The visual cliff was 23″ × 18″ × 12″. It was equally divided in half by a board forming two sections 18″ × 11 1/2″ × 12″ each. One section of the apparatus was entirely covered with a black and white checkerboard pattern composed of 3″ squares, while the other section has similar squares painted in a similar pattern on the underside of the cover glass.

A clean piece of clear glass was placed over the section containing the checkerboard pattern, while the other section contained a similar piece of glass covering it. The latter glass, however, contained the painted pattern on its underside. In order to insure the use of visual cues by the *S*s, rather than tactile cues due to stimuli received from their whiskers, the glass of each section was separated from the other section by a 2″ raised partition in the center.

3. *Procedure*

Each rat was placed on a starting position facing either end of the visual cliff but not towards the deep or the shallow end. Rats and gerbils were run, intermittently, depending on the performance of the previous *S*. Immediately after the running of each *S*, the glass covers were washed lightly with soap and water to eliminate possible olfactory cues from the previous run.

Latency time was measured with a stop watch from the moment the *S* was placed on the starting position to the time it crossed to one side of the apparatus or the other.

C. RESULTS

All of the gerbils went to the shallow side of the visual cliff, while one-half of the rats went to the shallow side, as shown in Table 1.

Table 1 also indicates the latency times for the *S*s. The rat *S*s had an average of 41.5 seconds, as compared to the gerbil mean latency time of 21.5 seconds. The fastest latency time for a rat *S* was 27 seconds; the slowest time

TABLE 1
SUBJECT, LATENCY TIME IN SECONDS, AND THE SIDE DESCENDED BY EACH SUBJECT

Subject	Latency time in seconds	Side
Rat		
1	31	Shallow
2	40	Shallow
3	56	Deep
4	27	Deep
5	43	Shallow
6	52	Deep
Gerbil		
1	16	Shallow
2	23	Shallow
3	19	Shallow
4	31	Shallow
5	12	Shallow
6	28	Shallow

was 56 seconds. The fastest latency time for a gerbil *S* was 12 seconds, while the slowest time was 31 seconds. As a group, the rat *S*s took almost twice as long a latency time as the gerbils did, collectively. A chi square between the shallow side-deep side performances indicated statistical significance, $\chi^2 = 4.00$, $df = 1$, $p < .05$, between the two groups of *S*s.

D. CONCLUSIONS AND DISCUSSION

The gerbils tended to have better depth perception than the albino rats. They not only showed a faster latency time than the rats, but they also had a significant preference for the shallow side of a visual cliff when compared with the rat *S*s.

Part of the faster latency time for the gerbils might have been due to their "wild" leaping ability, as compared with the more sedate ability of the rats. The gerbil is a leaping rodent and as such tends to use visual cues to judg distance and depth when leaping is involved. It then performs the leapin movement rather quickly. The rat, on the other hand, moves more cautiousl and uses olfactory and tactile cues, rather than the visual. Movement by th animal is made more slowly.

Even with the raised partition in the center of the cliff, two of the rat were able to rise up and touch the glass with their whiskers and noses. Becaus of this tactile information, the rats might have realized that there was surface that could have been walked on even though it was over the dee visual cliff area. At least in these two instances, tactile cues might hav predominated over the visual cues. These animals did proceed to descend on the deep side of the cliff.

Regardless of the side of descent, shallow or deep, all of the animals proceeded to their positions without further exploring the surface or the design under it. Because of a lack of exploratory behavior or a freezing of the *S*s, sometimes found in such research, it is questioned as to what extent depth perception was the most primary cue used by the animals in their movements. Other cues as well as "motives" might have determined their descent and relative performance. Depth perception is only one means of interpreting their different behavioral patterns on the visual cliff.

Specific depth cues, such as monocular cues, retinal disparity, and retinal image size, as well as possible other cues—such as olfactory and tactile, to which the animal responds in its performance on the visual cliff—need be examined before particular answers to specific questions in the area can be adequately answered.

E. Summary

Depth perception has been investigated with humans, rats, chickens, cats, and dogs, to name a few organisms, with use of the visual cliff. The literature suggests certain similarities and differences between and among different species. The present research attempted to find out (*a*) similarities and differences between the albino rat and the mongolian gerbil, and (*b*) differences in performance due to use of different cues. Results indicated a significant difference in performance ($p < .05$) between the rats and gerbils. They also indicated the importance of olfactory and tactile cues in performance, especially for the rat.

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THE EFFECTIVENESS OF A "RECREATIONAL" AND "THERAPEUTIC" ENCOUNTER WITH PSYCHIATRIC PATIENTS*

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A. INTRODUCTION

This is a report on research into the effectiveness of the programs of the Bedside Network of the Veterans Radio and Television Guild, which is a voluntary organization that has for 22 years sent members to entertain patients at Veterans Administration hospitals across the nation. An 1800-bed psychiatric hospital was selected as the site of the proposed research, and attention was focused on the music portion of the program.

"Effectiveness" was defined as the relative frequency of successful Bedside member-patient interactions. Two interactions were observationally recorded: (*a*) any instance of verbal exchange between a Bedside member and a patient that was initiated by the Bedside member, and (*b*) any instance of verbal exchange between a patient and a Bedside member that was in response to the initial probe of the Bedside member. The rate of successful interactions consisted of the ratio of Bedside initiated interactions to patient response interactions. Observers were instructed not to tabulate the frequency of the interactions that were not clearly discriminable.

B. METHOD

Five severely disturbed male psychiatric patients were selected for the study. Their ages ranged from 37 to 58 years. Two were practically nonverbal, one was belligerent and had a history of prior assaultive behavior, and two actively hallucinated. All five were withdrawn and asocial.

The setting for the observations was a large dayroom in the hospital in which the Bedside members held their performance at the same time and on the same day of each week. Rows of chairs faced an impromptu stage. Thirty-four

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[1] This research was undertaken when the author was research social psychologist at the Franklin Delano Roosevelt Veterans Administration Hospital at Montrose, New York. The cooperation of the volunteers of the Bedside Network of the Radio and Television Hospital Guild is gratefully acknowledged.

to 58 patients were ushered in by the hospital aides and seated in chairs. After the patients were seated, songbooks were distributed, and the names of those patients who wished to sing were recorded by two female volunteers. During the performance, the same volunteers would circulate among the audience, talk to patients, sing with them, and generally attempt to get them to participate. The other volunteers either played musical instruments, manned the recording equipment, or prompted the patient who was singing at the microphone. The interactions that were recorded were between the two female volunteers and any one of the five patients.

Both volunteers were observed for 15 minutes during each of five performances. A simple behavior checklist was used. A second naive observer was introduced for one performance, and the reliability of the observations, as measured by the proportion of shared observations to the total number of observations of all interactions, was 98 percent.

The frequency of group leader-patient interactions in group therapy training sessions was recorded in a similar way. These group sessions were conducted by male nursing aides for one-hour periods two days a week at the same time each morning with eight to 15 patients. The five patients previously selected for the Bedside study were participants. The frequency of the two types of interactions was recorded for each of the five patients for five of the group therapy sessions. Since both the Bedside performances and the group sessions occurred (approximately) two hours after drugs were administered to the patients, the effect of the drugs was controlled. No reliability check was made for group leader-patient interaction. However, the simple situation made the task of observing much easier: the aides usually directed single questions to the patients, there were fewer patients, and the observation area was small. As a further check against observer bias, none of the frequency counts was totaled until after the termination of the study.

C. RESULTS

The total frequencies of interactions between the Bedside members and patients were as follows: number of verbal exchanges initiated by the Bedside members with each of the five patients—first patient, 5; second patient, 3; third patient, 1; fourth patient, 6; fifth patient, 3; number of verbal exchanges by the same patients in the same order in response to probes by Bedside members—4, 3, 1, 4, 3.

The total frequencies of interactions between the group leaders and each of the five patients in the same order were as follows: number of verbal exchanges initiated by group leaders—12, 17, 8, 0, 9; number of verbal exchanges initiated by patients in response to probes by group leaders—1, 0, 0, 0, 1.

The ratios of successful Bedside member-patient interactions for the five patients were .8; 1.0; 1.0; .67; 1.0, as compared with ratios of .08; 0; 0; 0; .1 for the same patients in group leader-patient interaction. Given this definition of effectiveness, it was evident that the Bedside Network music program was more effective with patients than a program specifically designed to attain this type of effectiveness.

D. SUMMARY

The effectiveness of a music recreation program and a group therapy program was assessed. "Effectiveness" was operationally defined as the number of successful interactions (*a*) between the volunteers in the music program and members of a group of psychiatric patients and (*b*) between a group discussion leader and the same patients. The ratios of success (number of patient responses to number of initiated actions by group leader or volunteer) for the music program are nearly maximum for all cases, whereas the ratios of success for the therapy program are nearly minimum for the same cases.

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POSTLIST REHEARSAL AND THE RECENCY EFFECT OF SERIAL RECALL*

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A. INTRODUCTION

Laughery and Bergman (5) have recently distinguished between ordered (OR) and serial (SR) recall. In the OR procedure the recalled items must occupy the same serial positions that they did in presentation. In the SR procedure an additional restriction is placed on the subject (*S*): Not only must items occupy the same positions in presentation and recall, *S* must also structure his recall so that the first item output occupies the first serial position, the second item output occupies the second serial position, and so on. Recall probability in the SR task is highest for the first list item and decreases systematically through the list. As opposed to typical results from other recall tasks (3), the recency effect for SR (an increased recall probability for later list items) is usually confined to the last item in the list.

One way to approach the SR task is provided by a two-state conception of memory (10). Briefly, this model suggests that novel stimulus information is maintained in a brief memory store of relatively limited capacity (short-term memory) before it is encoded into a longer lasting and more commodious store (long-term memory). Rehearsal is the mechanism that maintains items in short-term memory (STM) and transfers them into long-term memory (LTM).

Specifically, the fact that each item in the SR task must be retained for a considerable period of time before recall suggests that these items are retrieved from LTM. Data to support this suggestion are provided by Cohen (2). This investigator found no change in the shape of the SR curve when recall was measured immediately after each list was presented and again after all lists had been presented in a multilist task.

Increased recall probability for early list items and the last list item suggests, according to the model, that these items receive extra rehearsal time. Rundus and his associates (7, 8) have demonstrated that early list items do receive

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extra rehearsals in free recall tasks, providing partial support for this assumption. One method of providing the extra rehearsal time for the last item would be to consider the interval between the last item and onset of the recall signal as a rehearsal period. Although the duration of this period is quite limited, it seems reasonable to assume that *S* has enough time to provide some extra rehearsal of the last item.

The present experiment was an attempt to test this last suggestion. Specifically, it was reasoned that the size of the recency effect would increase when the interval between the last item and recall increased, and the recency effect would be eliminated when a rehearsal-preventing task filled this interval.

B. METHOD

1. *Subjects*

The *S*s were 60 students from introductory psychology classes at Ball State University who fulfilled a course requirement by participation in the experiment.

2. *Materials*

Six 18-item lists were randomly composed from the 117 easiest-to-pronounce trigrams scaled by Underwood and Schulz (9). A complete set of six new lists was composed after three *S*s from each condition of the experiment had been presented with one of the sets. A total of five such sets of lists were utilized in the experiment. In addition two practice lists of 18 items each were composed from the middle values of the Underwood and Schulz (9) scaling.

3. *Design and Procedure*

Both (*a*) nature of the activity between the last item and recall (either an unfilled delay or counting backwards) and (*b*) length of the interval between the last item and recall (either three or nine seconds) were manipulated orthogonally between *S*s. A total of 15 *S*s served in each of the four between-*S*s conditions.

Each *S* was run individually and was presented with the two practice lists and six experimental lists for one trial each. Items were back-projected by a Kodak Carousel projector onto a Plexiglas screen situated approximately two feet in front of the seated *S*. Stimulus items were presented to a height of approximately two inches at a three-second rate.

The *S*s in the counting conditions (C) counted backwards by threes from a three-digit number which was presented immediately after the last list item. The *S*s in the conditions not requiring counting (NC) were given an unfilled delay following the last item. A written recall period of 30 seconds followed this interval and was signalled by a clump of asterisks which appeared on the screen either three or nine seconds after the last list item. Individual sheets with 18 blanks on each were provided by the experimenter (*E*) for recall. Recall always started with the first serial position and proceeded down the list culminating with the last serial position. The *S* was not allowed to go back through the list to fill in extra items or change any item. All *S*s were carefully watched by *E* in order to insure compliance with this requirement.

C. RESULTS

The experimental unit for the statistical analysis was the total number of correct trigrams for an *S* at a given serial position. A trigram was scored as correct if it was recalled regardless of the serial position of its recall. This procedure was utilized in order to maximize recall performance (1).

Because of the theoretical basis of this study, separate analyses of variance were performed on the data at serial positions 1 through 6, 7 through 12, and 13 through 18. The only effects to reach significance in these analyses were

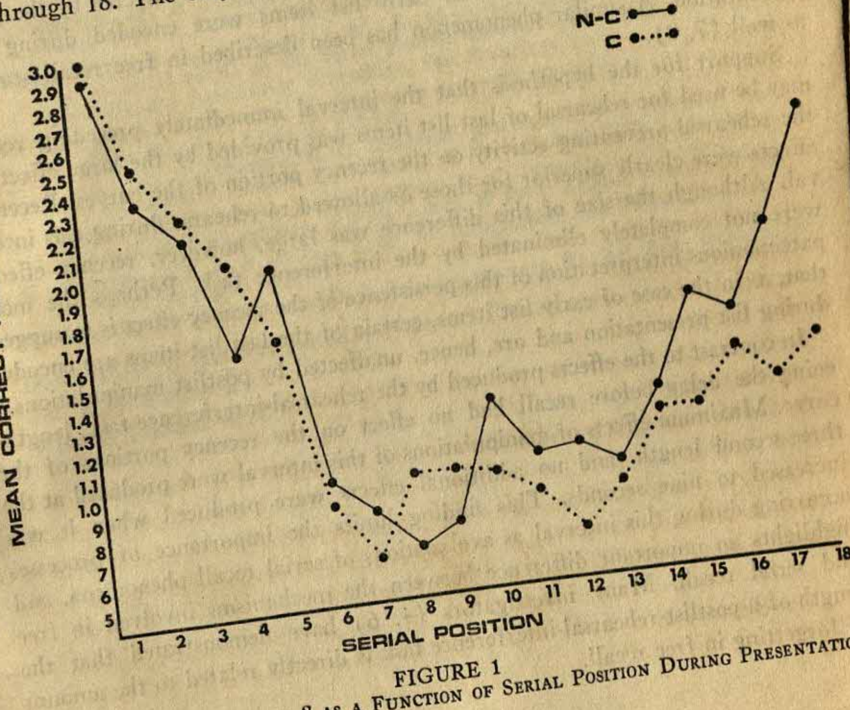

FIGURE 1

MEAN CORRECT RECALL FOR *S* AS A FUNCTION OF SERIAL POSITION DURING PRESENTATION serial position (SP) in trials 1 through 6, $F\ (5, 550) = 5.012$, $p < .001$, and the effect of counting or not-counting (C-NC) in serial positions 13 through 18, $F\ (1, 56) = 5.439$, $p < .001$. Neither the main effect of length of delay (D), nor any interactions involving this effect, reached significance in the analyses. In order to gain further purchase on the results, the data were grouped over the D variable and another set of analyses was conducted. These analyses supported the graphical results of Figure 1; the effect of SP in the first analysis (for serial positions 1 through 6) was significant, $F\ (5, 290) = 25.766$, $p < .001$, as were the effects of SP and C-NC in the last six serial positions. Respective F values for these effects were as follows: SP—$F\ (5, 290) = 7.352$, $p < .001$; and C-NC—$F\ (1, 58) = 5.469$, $p < .001$. These significant effects reflect the strong primacy portion of the curves and the fact that while recall is better for NC *S*s than for C *S*s on the latter half of the lists, there is a recency component for both.

D. DISCUSSION

The fact that the first two-thirds of the lists were not affected by the postlist manipulations suggests that early list items were encoded during list presentation. A similar phenomenon has been described in free recall studies as well (7, 8).

Support for the hypothesis that the interval immediately preceding recall may be used for rehearsal of last list items was provided by the large effect of the rehearsal-preventing activity on the recency portion of the curves. Recency effects were clearly superior for those *S*s allowed to rehearse during this interval. Although the size of this difference was large, however, recency effects were not completely eliminated by the interference task. Perhaps the most parsimonious interpretation of this persistence of the recency effect is to suggest that, as in the case of early list items, certain of the last list items are encoded during list presentation and are, hence, unaffected by postlist manipulations.

In contrast to the effects produced by the rehearsal-interference task, lengthening the delay before recall had no effect on the recency portions of the curve. Maximum effects of manipulations of this interval were produced at the three-second length, and no additional effects were produced when it was ncreased to nine seconds. This finding limits the importance of processes ccurring during this interval as explanations of serial recall phenomena, and ighlights an important difference between the mechanisms involved in free d serial recall. Many investigators (4, 6) have demonstrated that the ngth of a postlist rehearsal-interference task is directly related to the amount forgetting in free recall.

E. SUMMARY

The present experiment was an attempt to extend a two-state conception of memory to the serial recall task. Specifically, *S*'s activity following presentation of a serial list of trigrams was designed to provide periods of varying durations of unrestricted rehearsal or of rehearsal interference. The fact that the recency effect was decreased when the rehearsal-interfering task filled the interval between list presentation and recall was interpreted as supporting the validity of this conceptualization of memory. A limit to the usefulness of this interval as an explanatory device for serial recall phenomena was suggested by the fact that increasing the duration of the interval had no effect on performance.

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